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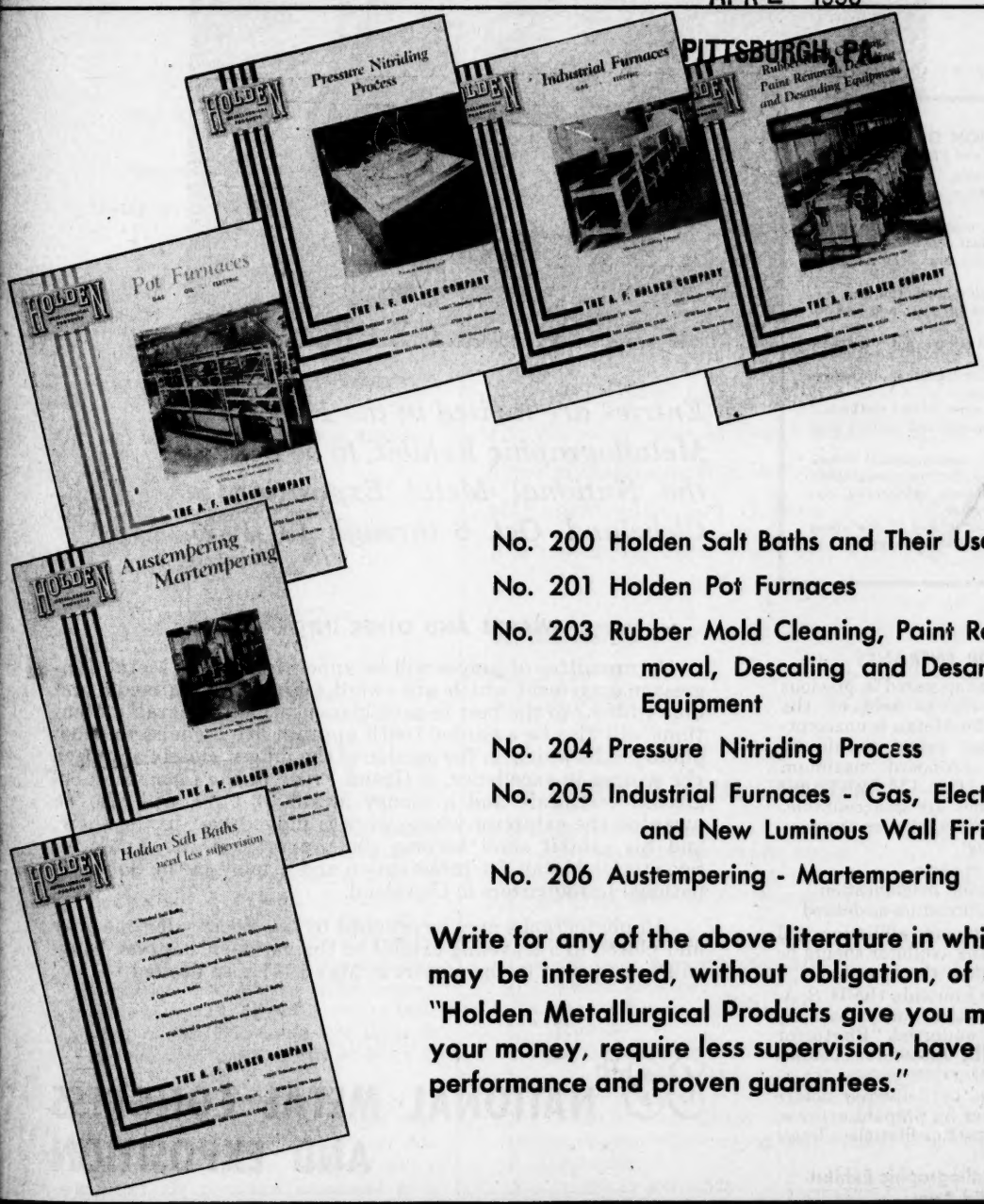
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These new and revised bulletins are available for Holden Metallurgical Products and Industrial Furnaces:

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No. 204 Pressure Nitriding Process

No. 205 Industrial Furnaces - Gas, Electric and New Luminous Wall Firing

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Write for any of the above literature in which you may be interested, without obligation, of course. "Holden Metallurgical Products give you more for your money, require less supervision, have proven performance and proven guarantees."

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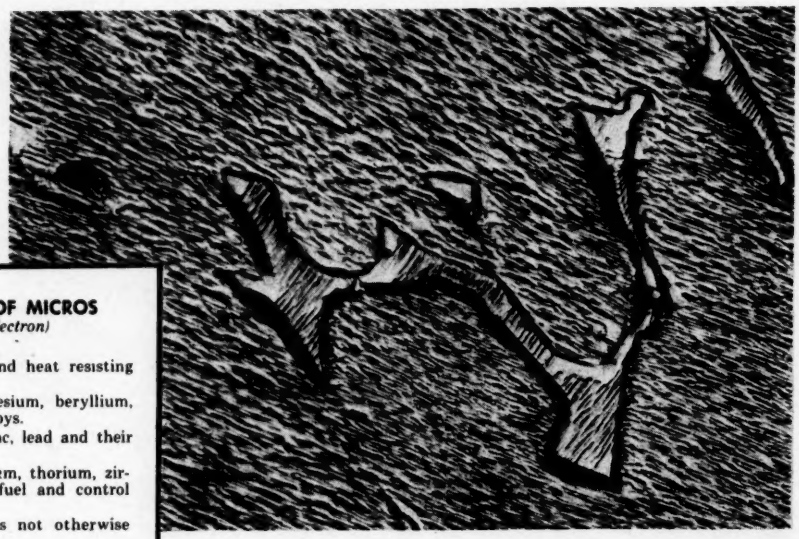
THREE POINTS—LOS ANGELES, DETROIT and NEW HAVEN

11th Metallographic Exhibit



CLASSIFICATION OF MICROS
(Optical and Electron)

Class 1. Irons and steels.
Class 2. Stainless steels and heat resisting alloys.
Class 3. Aluminum, magnesium, beryllium, titanium and their alloys.
Class 4. Copper, nickel, zinc, lead and their alloys.
Class 5. Uranium, plutonium, thorium, zirconium and reactor fuel and control elements.
Class 6. Metals and alloys not otherwise classified.
Class 7. Series showing transitions or changes during processing.
Class 8. Welds and other joining methods.
Class 9. Surface coatings and surface phenomena.
Class 10. Results by unconventional techniques (other than electron micrographs)
Class 11. Slags, inclusions, refractories, cermets and aggregates
Class 12. Color prints in any of the above classes (no transparencies accepted)

Entries are invited in the 11th ASM Metallographic Exhibit, to be held at the National Metal Exposition in Cleveland, Oct. 6 through 12, 1956.

RULES FOR ENTRANTS

Work which has appeared in previous metallographic exhibits held by the American Society for Metals is unacceptable. Photographic prints should be mounted on stiff cardboard; maximum dimensions 14 by 18 in. (35 by 45 cm.) Heavy, solid frames are unacceptable. Entries should carry a label on the *face* of the mount giving:

Classification of entry
Material, etchant, magnification
Any special information as desired

The name, company affiliation and postal address of the exhibitor should be placed on the *back* of the mount.

Entrants living outside the U. S. A. should send their micrographs by first-class letter mail endorsed "Photo for Exhibition—May be opened for customs inspection".

Exhibits must be delivered before Oct. 1, 1956, either by prepaid express, registered parcel post or first-class letter mail, addressed to:

ASM Metallographic Exhibit
7301 Euclid Ave.
Cleveland 3, Ohio

AWARDS AND OTHER INFORMATION

A committee of judges will be appointed by the Metal Congress management which will award a First Prize (a medal and blue ribbon) to the best in each classification. Honorable Mentions will also be awarded (with appropriate medals) to other photographs which, in the opinion of the judges, closely approach the winner in excellence. A Grand Prize, in the form of an engrossed certificate and a money award of $100, will also be awarded the exhibitor whose work is judged best in the show, and his exhibit shall become the property of the American Society for Metals for preservation and display in the Society's national headquarters in Cleveland.

All photographs may be retained by the Society for one year and placed in a traveling exhibit to the various Chapters. They will be returned to the owners in May 1957 if so desired.

38TH NATIONAL METAL CONGRESS AND EXPOSITION

CLEVELAND, OHIO **OCTOBER 6 to 12, 1956**

Metals Review

VOLUME XXIX, 3

March, 1956

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A.S.M. Chapter Scholarships and Student Aids

When A.S.M. Scholarships are considered, we sometimes think only of those sponsored by the A.S.M. Foundation for Education and Research which is currently awarding 52 undergraduate grants.

These are important, and A.S.M. is justly proud of their wide-spread benefits. But A.S.M. chapters are also sponsoring student aids whose results, although particularly local in interest, are nevertheless a reflection of the Society's concern about the education of more young people for engineering careers.

A review of scholarship and other student aid activities on the part of individual chapters is indeed impressive. This review is the result of chapter reports. Doubtless many other chapters will wish to add their programs to the list. Chapters which underwrite scholarships of their own are listed in the table below:

CHAPTER	Amount	Recipient	How Financed
BOSTON	$300	College Freshmen	Educational Courses
BRITISH COLUMBIA	$100	High-School Graduate Entering Vancouver Vocational Institute	Chapter Treasury
CALUMET	$400 and $100	High-School Seniors	Sustaining Members
CAROLINAS	$200	North Carolina State College Students	Percentage of Sustaining Members Dues
CLEVELAND	$400	Case Institute Sophomore	General Funds
COLUMBIA BASIN	$100	High-School Graduate	Educational Courses
GOLDEN GATE	$400	Two $200 Awards to Stanford and University of California Students	Educational Courses
INLAND EMPIRE	All Book Expenses	Metallurgy Sophomore	Educational Courses
MICHIGAN COLLEGE OF MINES & METALLURGY	$25	High-School Seniors	Underwritten Jointly by Chapter and Alpha Sigma Mu Fraternity
MINNESOTA	$200	University of Minnesota Students	Donations From Local Industry
MONTREAL	Cash and Books	Senior Metallurgy Student. Books to top students.	General Funds
NORTHERN ONTARIO	$150	Freshman Engineering Student	General Funds
ONTARIO	Cash	Three Scholarships for Freshmen. Books donated to University	General Funds and Educational Courses
PROVIDENCE	$200	First and Second Year High-School Students	Advertising on Meeting Announcements and Educational Course
SAGINAW VALLEY	$250	First and Second Year High-School Students	Year Book Advertising
UTAH	Cash and Books	Cash and Tuition Plus Cost of Books for Junior and Senior High-School Students	Chapter and Industrial Contributions

Students' aids by chapters are not always designated as scholarships. Benefits, however, are equally important. Some of these special awards and grants are as follows:

BRITISH COLUMBIA	$50	Best Apprentice in Machine Shop Field Upon Completion of Apprenticeship	General Funds
BUFFALO	Loan Fund	Students at Erie County Technical Institute	General Funds
CINCINNATI	$50	Esslinger Award to University of Cincinnati Student	General Funds
KANSAS CITY	Recognition	Honorary Recognition for Outstanding Students of Metallurgy	
LEHIGH VALLEY	Plaque	High-School Students	
MAHONING VALLEY	$50	Two Awards of $25 for Students at Youngstown University and Grove City College	General Funds
NEW HAVEN	$200	To Promote Education in Metallurgy, $100 Awards to New Haven College and Yale University	General Funds
NEW JERSEY	$320	Prizes for Outstanding Reports on Metal Treatment at Eight Vocational Schools.	General Funds
OREGON	$100	Three prizes for Technical Papers by Students at Oregon Colleges; $50, $30 and $20	General Funds
OTTAWA VALLEY	$75	Three Awards of $25 to Freshmen Engineering Students	General Funds
PHILADELPHIA	$50	Annual Prize for Best Micrograph	General Funds
PITTSBURGH	$75	Three $25 Awards for Exhibits at Science Fair	General Funds
SYRACUSE	Cash	Financial Support to Central New York Science Congress	General Funds
WARREN	Cash	Shares Scholarship With Mahoning Technical Society	General Funds

Definite plans are under way for the sponsorship of scholarships and other awards by the following chapters: Baltimore, Dayton, Indianapolis, Long Island, New Orleans, Phoenix and Savannah River.

Explains Transitions in Mild Steels

Principals at a Meeting Held Recently by the Long Island Chapter Included, From Left: Walter A. Stadtler, Technical Chairman; Clarence H. Lorig, National Treasurer and Technical Director, Battelle Memorial Institute, Who Spoke on "Mild Steel—Its Ductile to Brittle Transition"; Herbert S. Kalish, Chapter Chairman; and National Secretary, William H. Eisenman

Speaker: C. H. Lorig

Battelle Memorial Institute

Clarence H. Lorig, national treasurer A.S.M. and technical director, Battelle Memorial Institute, presented a talk entitled "Mild Steel—Its Ductile to Brittle Transition" at a meeting of the **Long Island Chapter.** William H. Eisenman, national secretary, was also a guest at this meeting.

Dr. Lorig explained that up to World War II, very little was known about the behavior of mild steel in service, even though it was widely used for such things as gas transmission lines, storage tanks and shipbuilding.

It was during World War II that failures of mild steel in the form of cracks in hull and deck plates of merchant ships alone amounted to losses of $100 million. For this reason, $4 million was invested to determine why these failures occurred.

It was found, upon investigation, that while mild steels exhibit satisfactory tensile and yield properties, a variation shows up in notch toughness. Dr. Lorig pointed out the three factors responsible for brittle failure—high stresses, notches and notch toughness of the steel. Studies revealed that stress is dependent upon temperature and/or notches present. Along this line of reasoning, the Standard Oil Development Co. has devised the S.O.D. transition temperature test. This test employs a specimen containing a crack induced by stressing at liquid nitrogen temperatures and a notch opposite this crack. Holding the ends of the specimen in tension, an impact force is imparted to the specimen at the induced crack to determine the stress and temperature at which the crack, once started, will propagate completely through the specimen. Stress versus temperature relationship are then plotted, based on test results.

Dr. Lorig stated that effect of notches upon brittle behavior is a highly complex subject. Therefore, he did not go into any great detail about this factor, other than to illustrate with slides the stress distribution at the notched area.

The third factor, notch toughness, was covered quite fully. While evaluation of notch toughness can be carried out by many tests, the two used most widely are the Charpy V-notch and the keyhole notch tests. They are carried out over a broad temperature range in an effort to determine the transition temperature. This temperature is one at which the fracture of the steel changes from the ductile to the brittle type. It is not a fixed temperature but varies with the type of the notch, the geometry of the specimen and the criteria used in defining the fracture transition.

Dr. Lorig also explained the effects of carbon content, along with other elements, upon transition temperature. These effects are best utilized in design work. It was shown how a variation of the manganese-carbon ratio yields broad design possibilities since different transition temperatures can be attained even though tensile values are held constant. Also, grain control and normalizing can be employed to lower the transition temperature still more.

In conclusion, Dr. Lorig stated that tensile properties give little indication of brittle failures in mild steel, but that notches, temperature and temperature sensitivity of the steel are of great importance. An interesting question and answer session followed Dr. Lorig's talk.—**Reported by C. F. Zabriskie for Long Island.**

Nominating Committee for A.S.M. National Officers

In accordance with the Constitution of the American Society for Metals, President Adolph O. Schaefer has selected a nominating committee for the nomination of president (for one year), vice-president (for one year), and two trustees (for two years each). This committee was selected by President Schaefer from the list of candidates submitted by the chapters. The personnel is:

Chairman: Carl B. Post (Lehigh Valley Chapter), Carpenter Steel Co., Reading, Pa.

Harold J. Roast (Ottawa Valley Chapter), 140 Grosvenor Ave., Ottawa, Ont.

D. J. Wright (Peoria Chapter), Caterpillar Tractor Co., Peoria, Ill.

H. E. Flanders (Utah), University of Utah, Salt Lake City, Utah.

James V. Coulter (Golden Gate Chapter), Coulter Steel & Forge Co., Emeryville, Calif.

Oscar T. Marzke (Washington Chapter), Division of Physical Metallurgy, Naval Research Laboratory, Washington 20, D. C.

Arnold L. Rustay (Worcester Chapter), Wyman-Gordon Co., Worcester, Mass.

A. R. Fairchild (Carolinas Chapter), Western Electric Co., Winston-Salem, N. C.

Albert T. Ridinger (Minnesota), Metallurgical Inc., 900 East Hennepin, Minneapolis 14, Minn.

Also in accordance with revisions of the constitution adopted in October 1944, a committee for the nomination of secretary (two years) has been appointed, consisting of the president of the society as chairman and the six immediate living past presidents. Personnel of the committee is as follows: Adolph O. Schaefer, chairman, George A. Roberts, James B. Austin, Ralph L. Wilson, John Chipman, Walter E. Jominy, and Arthur E. Focke.

These two committees will meet during the third full week in the month of May. They will welcome suggestions for candidates in accordance with the A.S.M. Constitution, Article IX, Section 1 (b), which provides that endorsements of a local executive committee shall be confined to members of its local chapter, but individuals of a chapter may suggest to the nominating committee any candidates they would like to have in office. Endorsements may be sent in writing to either chairman or any other member of either committee.

Texas to Aid Rice Institute

The Texas Chapter is cooperating with Rice Institute on a program to obtain more complete metallurgical equipment for the Institute. Clyde Dill, a member of the Chapter, is heading a committee working on this project.

Describes Causes of Residual Stress

Shown at Past Chairmen's Night in Rochester Are, From Left: Leon R. Kimpal, Chairman; W. G. Johnson, Who Spoke on "Residual Stresses in Crankshafts"; Frank McDonald, Past-Chairman; F. M. Dale, First Chairman; and N. J. Finsterwalder, Vice-Chairman. (Photo by B. N. Iannone)

Speaker: William G. Johnson

Caterpillar Tractor Co.

William G. Johnson, general supervising engineer, Caterpillar Tractor Co., accompanied his discussion on "Residual Stresses in Crankshafts" with numerous slides graphically illustrating each point at a meeting held by **Rochester Chapter.**

By dividing his talk into three classifications, Mr. Johnson was able to bring out the basic considerations which, while applying specifically to crankshafts, can be related to various other types of forgings and castings as well.

The first consideration is to recognize that residual stresses set up in heat treatment are due to the expansion and contraction of the steel when heated and cooled. The illustrations showed the phenomena of tension and compression which occur in different types of sections and account for the presence of the residual stresses.

Secondly, after determining all of the factors causing this condition, it is necessary to break each one down into an individual problem by an extensive series of test specimens and varying heat treatments to arrive at acceptable finished parts. Throughout this procedure the tests are checked by plotting the stress-strain curves, as indicated by the use of wire strain gages and thermocouples. This produces the data necessary to decide either how unimportant or how serious each type of heat treatment will be in the ultimate performance of the completed unit.

The third phase of Mr. Johnson's lecture covered production problems due to residual stresses and the remedies used to overcome them. It has been found that, with engine blocks, the rate of cooling is too great between the outside, center and inside walls. Various remedies have been tried using chill blocks and different designs but best results are obtained by coring the inside of the casting and using green sand.

With crankshafts being induction-hardened, the Sach's method of testing is used to study actual stress distribution in a cylinder. Satisfactory corrective measures include surface rolling of a filleted crankshaft and shot peening to relieve torsional stresses. It is important to observe junction points and keep them away from the high speed of the induction area.

By checking four sections of a 26-in. diam. gear, it has been determined that it showed high compression on the outside and tension on the inside. Cutting of the sections with a Radiac wheel produced only shallow stresses and allowed testing without introducing new strains.

Mr. Johnson summarized by stating that there is evidence to support the idea that a fatigue failure is due to repeated tensile stresses and not compressive stresses, and also that failure of an oil hole in an induction-hardened shaft does not start at the surface but at a point which coincides with the point of maximum tensile stress adjacent to the induction-hardened area. Protection of the oil hole by inserting a copper plug, thereby reducing the magnitude of the tensile stress at the outside and producing a compressive stress down into the oil hole, will increase the fatigue life.

This meeting was the occasion of honoring past chairmen, 16 of whom attended. Noteworthy was the presence of our first Chairman, F. M. Dale, Rochester Machine Screw Co., who served during the 1920-1921 season.—**Reported by Frank J. Gehrlein for Rochester Chapter.**

Talks in Western Ontario on Continuous Casting of Steel

Speaker: T. H. Adair

Atlas Steels Ltd.

T. H. Adair, chief plant metallurgist, Atlas Steels Ltd., presented a talk on the "Development of Continuous Casting" at a meeting held recently by **Western Ontario.**

A past-chairman's certificate was presented to Trevor Heard by Frank Miller, present chairman. During the meeting W. F. Clinton was elected secretary to fill the vacancy caused by the death of Earl Backman.—**Reported by Frank Miller for Western Ontario.**

Dayton Members Tour Bell Telephone Co.

A Bell Telephone Guide Is Shown Collecting a Group of Dayton Chapter Members and Friends for a Tour of the Company During a Chapter Meeting

At one of the meetings held by the **Dayton Chapter,** the members, wives and friends, 90 of them, visited the central office of the Bell Telephone Co. in Dayton. The two-hour tour included an inspection of the dial exchange equipment, A.T.&T. long lines and micro-wave television facilities. New developments in phone answering equipment and mobile radio telephone were of interest to the men while the ladies were impressed by the manual switchboard exchanges and operations in the customer service department.

Following the tour, refreshments were served. A short talk on the telephone company's public relations concluded the visit.—**Reported by E. E. Barney for Dayton.**

Better Mousetraps Topic at Boston

"Building Better Mousetraps" Was the Topic of a Talk Presented by Harrison I. Dixon, Metallurgical Products Co., at a Meeting of the Boston Chapter. Shown, from left: Mr. Dixon, N. Grant, technical chairman, and J. L. Morosini, chapter chairman. (Photograph by H. L. Phillips for Boston)

Speaker: H. I. Dixon

Metallurgical Products Co.

Harrison I. Dixon, president of the Metallurgical Products Co., recently spoke before the **Boston Chapter** on the subject "How to Build Better Mousetraps".

Mr. Dixon prefaced his talk with a plea for better recognition of the metallurgist whose efforts have been largely overlooked. The metallurgist was responsible for the development of many of the alloys and processes which have contributed immeasurably to the technological advances made during the war and postwar periods. He expressed a desire to secure better publicity, on a national level, to acquaint the public with many of the metallurgical accomplishments which have been heretofore unheralded.

Mr. Dixon pointed out the constant need for competitive industry to search for improved manufacturing methods. Many of our industries are going out of business each year because they are resistive to manufacturing and processing changes. They are not willing to search for more economical methods of manufacturing parts where expensive secondary operation costs are minimized. He quoted a slogan which has been applied to this thinking "You can't produce today's products by yesterday's methods and remain in business tomorrow".

Many of our industrial plants have conducted courses in value analysis which have resulted in substantial savings. One large electrical manufacturer conducts a 30-day course in this study and the savings resulting from the collective ideas of one session amounted to some $1,300,000. This can be done in other industries with similar success.

Many casting processes have become popular in recent years because of the reduced amount of labor required for expensive finishing operations. Mr. Dixon discussed the merits and limitations of each of the popular casting methods.

Investment or "lost wax" castings were formerly used only in the dental field. Today this process is one of the most widely used casting processes and a sales volume of 175 million dollars is predicted for 1956. This method produces castings of down to plus or minus 0.005 in. per in. tolerances and 125-micro-in. surface finish. In many instances no further operations are required.

Mercasting or the frozen mercury process is closely related to investment casting and is used where the size, tolerance, interior coring and finish will not permit other methods of manufacture. Complex assemblies can be cast integral by this process. This method involves the use of frozen mercury invested patterns in place of either wax or plastic used in the investment casting method. Tolerances of plus or minus 0.003 in. per in. and microfinish of 63 or better are commonly obtained. Curved inner surfaces are possible because interior cores do not have to be removed, this being accomplished by use of a match plate which locks in between the two die halves.

Zinc and aluminum die castings have long been used in the automotive field to eliminate many expensive secondary operations. This method is now being applied with great success in manufacture of brass and bronze die and permanent mold castings, quite often using shell cores, resulting in finished parts requiring only inexpensive tapping, drilling or broaching operations.

Shell molding is a method of producing castings where the tolerances are not quite as restrictive. This method is applied to many parts which were formerly sand cast and where improved finish was desired.

Mr. Dixon presented slides and display panels of "case histories" showing the various casting methods and the products produced by these methods. He pointed out that it is wise to weigh carefully the merits of each method before deciding which would be most economical in the particular problem involved. In his lecture a formula was outlined whereby this could be determined beforehand based on die cost, number of pieces, "as cast" cost and secondary operation cost. In many instances size, quantity, tolerances or finish would be the determining factor, along with price, in deciding which method would best apply.

The meeting was followed by an active question period in which many individual problems were discussed.

—Reported by W. H. McCarty for Boston Chapter.

Methods and Problems of Metal Cleaning Subject At Cleveland Meeting

Speaker: Braly S. Myers

International Harvester Co.

Braly S. Myers, materials engineer, International Harvester Co., discussed "Metal Cleaning" at a meeting held in **Cleveland.**

His talk began with the problem of selecting the right process for the job. This, he predicted, would be decided by such considerations as: How clean do you want it; do you want to leave a protective coating; what process should you use; how should it be applied; what quantities are involved; and whose material and what kind?

Mr. Myers discussed some of the methods available, including alkaline cleaning, emulsion cleaning, the emulsifiable mixture methods, the solvent types, steam cleaning, ultrasonic cleaning, various combinations of these methods and phosphatizing after cleaning. He also discussed the problem of drying the parts after cleaning and thoroughly covered the cost problem, using graphs as a means of comparison.

Mr. Myers pointed out the prime characteristics of a good cleaner. Basically these are the ability to reduce surface and interfacial tensions, produce active alkalinity, buffer a highly alkaline solution, soften hard water, be rinsed freely, be noncorrosive, free-flowing, dustless and nonhygroscopic, and to deflocculate, dispense and emulsify removed soils.

Mr. Myers' talk covered the effect of pH in alkaline cleaners, the conductivity of alkaline solutions for electrolytic cleaning, the effect of the work's surface condition and the foam problem. In closing, he emphasized the universal solvent, water, as still being a very important cleaner.

—Reported by J. J. Glubish for Cleveland Chapter.

A.S.M. Members' Names Added to Quarter Century Club Roster

The following A. S. M. members have been awarded honorary certificates commemorating 25 years consecutive membership in the Society:

Baltimore Chapter—Elmer B. Dunkak, Donald Loveless.

Boston Chapter—A. J. McDuff, Crucible Steel Co. of America.

Buffalo Chapter—Claude R. Bishop, Alfred F. Crone, Marvin J. Udy, Oliver H. Wuetig, Joseph T. Ryerson & Son, Inc.

Canton-Massillon Chapter—H. C. Weirick.

Chicago Chapter—H. A. Anderson, Ivan R. Dawson, Frank O. Fischer, Wilbur O. Igelman, Western Electric Co.

Cincinnati Chapter—William Heilig.

Cleveland Chapter—A. H. Allen, A. E. Beighley, Harold E. Campbell, Walter Carroll, Alton F. Davis, Ralph R. Leo, T. F. Schilling, Francis P. Whalen, Cleveland Punch & Shear Works Co., Latrobe Steel Co.

Columbus Chapter—Mars G. Fontana, Daniel E. Krause, Henry S. Schaufus.

Dayton Chapter—Charles E. Mentel, Jr.

Detroit Chapter—R. A. Clark, H. T. Cousins, Walter F. Herdrich, J. E. Spittle.

Eastern New York Chapter—Arthur Willink.

Golden Gate Chapter—Nordstrom Valve Division of Rockwell Mfg. Co.

Hartford Chapter—H. D. Phillips, Ronald W. Price.

International Chapter—Henry T. Wordsworth.

Lehigh Valley Chapter—L. W. Hopkins, Marvin C. Moffett.

Long Island Chapter—Emerson S. Norris.

Los Angeles Chapter—George L. Messall, C. B. Sadtler, Aluminum Co. of America.

Milwaukee Chapter—V. H. Erickson, John McBroom, W. G. Schneider, Babcock & Wilcox Co.

Montreal Chapter—Clyde Brennan, C. M. Carmichael, Armand J. Dussault, Carl R. Wittemore, Air Reduction Canada, Ltd., Canadian Foundry Supplies & Equipment, Ltd., Shawinigan Chemicals, Ltd.

New Haven Chapter—Albert D. Eplett, Henry G. Keshian, Wallace B. Smith, Malleable Iron Fittings Co.

New Jersey Chapter—Harold N. Ewertz, George A. Lennox, Albert J. Phillips, William C. Schulte, Carl W. Shattuck, Bethlehem Steel Co., Hoyland Steel Co., Inc.

New York Chapter—T. N. Armstrong, C. R. Austin, Clayton D. Grover, D. A. Lawless, Theron D. Parker, Charles H. Prance.

Ontario Chapter—R. J. Anderson, Canadian Westinghouse Co., Ltd., B. Greening Wire Co., Ltd.

Oregon Chapter—Norton L. Peck.

Philadelphia Chapter—John E. Haig, Joseph G. Jackson, William A. McCreavy.

Pittsburgh Chapter—Edgar Marburg, Leon H. Nelson, Albert T. Reichenbach, Carl J. Stroble, Richard L. Templin, Arthur W. Thornton.

Rochester Chapter—E. A. Basilio.

Springfield Chapter—Oscar E. Koehler.

Syracuse Chapter—James Hutton.

Texas Chapter—Milton E. Holmberg.

Toledo Chapter—Richard W. Hunt.

Warren Chapter—James J. Bowden, Howard G. Porter.

Washington Chapter—William C. Stewart, Allan L. Tarr, J. G. Thompson.

Worcester Chapter—John D. Bennett, Donald B. Wilson, Worcester County Electric Co.

York Chapter—H. E. Warren.

Flame Plating Discussion Featured at Tulsa Meeting

Speaker: M. L. Powers

Linde Air Products Co.

M. L. Powers, service engineer, Linde Air Products Co., appeared before the **Tulsa Chapter** during a recent meeting.

The speaker presented an illustrated talk on the application of ceramic and wear resistant coatings by means of Linde's patented "Flame Plating" process.

The meeting was exceptionally well attended, with over 50% of the active membership present. By aid of film strip illustrations, as well as numerous workpieces, Mr. Powers was able to graphically explain the new flame plating process and to stimulate the imagination of his audience so that the discussion period following his talk was extremely interesting.—**Reported by J. C. Holmberg for Tulsa.**

Describes Miniature Bearing Industry

H. M. Dardani, Miniature Precision Bearings, Inc., presented a talk entitled "Mighty Miniatures" at a Meeting Held in Worcester. Shown are, from left: R. H. Carter, Miniature Precision Bearings, Inc.; Mr. Dardani; and Leonard L. Krasnow, Lodding Engineering Co., meeting technical chairman

Speaker: H. M. Dardani

Miniature Precision Bearings, Inc.

Members of the **Worcester Chapter** heard a talk by H. M. Dardani, vice-president in charge of manufacturing, Miniature Precision Bearings, Inc.

Mr. Dardani gave a brief history of the company from its start 35 years ago to its position of leadership today in the design and manufacture of miniature ball bearings.

Miniature bearings are classified as such when the diameter is less than ⅜ in. The smallest commercial bearing made by the company has a 1/10 in. outside diameter.

Mr. Dardani described the manufacture of miniature bearings and touched briefly on some of the 35 separate operations necessary to complete a bearing. Quality control is strictly enforced throughout the plant, assuring customers of a quality product. Miniature bearings are used in delicate mechanisms, such as radar sets, and when torque requirements are very rigid. Grinding operations require a 4 to 6 micro-in. finish and polishing and lapping are used for final finishes.

Mr. Dardani stated that 75% of the operators who produce over 400 types and sizes of bearings are women. When bearings are completed they have never been touched by hand. Final inspection, cleaning and lubrication to keep out dust, which can injure the life of a bearing, complete the manufacturing process.

A sound movie entitled "Manufacture of Miniature Bearings" was shown, with an interesting question and answer period following.—**Reported by Edward F. Grady for the Worcester Chapter.**

Metallurgical News and Developments

Devoted to News in the Metals Field of Special Interest to Students and Others

A Department of *Metals Review*, published by the
American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio

To Produce Aluminum—Olin Mathieson Chemical Corp. will invest $120,000,000 to build the world's first fully integrated aluminum plant. Coal mined directly on the site will be used to provide the large power requirements for the reduction of alumina to pig aluminum. The alumina plant, the reduction plant and rolling mill will be on the Ohio River near Clarington, Ohio.

Road-Signs—Burma Shave Co. is covering all of its 6000 sets of signs, seen along the highways of the nation, with aluminum sheet, to cut down on the maintenance required of the old wooden signs.

New Uranium Program—A.E.C. has appointed Lucius Pitkin, Inc., New York, as its representative to conduct the program for uranium and vanadium procurement and concentrate-receiving in the Western United States. Pitkin will be responsible for receiving and stockpiling of uranium ores and concentrates and evaluating for purpose of paying the producers.

On the Job—A firm which has hired only men for 77 years has admitted defeat. The American Gas Furnace Co., unable to find the proper man for the job, has hired a woman as telephone switchboard operator. President Philip Osterman explained: "We felt that men should work and women should keep the home, but we're licked now".

Conference—The 7th annual Engineering Conference will be held on the Virginia Tech campus, Blacksburg, Va., Apr. 26 to 28. The theme of the conference is "Engineering, the Summation of the Sciences". The conference is sponsored by the Association for the Advancement of Engineering, a student organization, in cooperation with the dean and faculty of the School of Engineering and Architecture.

Battelle Reactor—A reactor development laboratory, for use by industry and government in the development of reactors for power production and propulsion, has been completed at Battelle Memorial Institute. The lab is the second major unit in Battelle's new Atomic Energy Center and is the first private installation of its kind available for direct research on atomic power plants.

Corrosion Symposium—A symposium, jointly sponsored by the Niagara Frontier Section of the National Association of Corrosion Engineers and the University of Buffalo, will be held May 9 and 10 on the University campus. The symposium covers the proper use and application of metals and alloys to prevent corrosion in the chemical industry.

Anniversary—The celebration of the 100th anniversary of the Verein Deutscher Ingenieure will be held from May 12 through 15 in Berlin. A series of technical discussions has been planned to cover technical advances in Germany.

Research Grant—The Steel Founders Society, continuing its search for an inorganic bonding material, awarded a contract for nearly $100,000 to Horizons Inc., to carry out the search for a suitable inorganic bonding material. Horizons is to study the properties and behaviors of potential inorganic bonds and to develop materials and processes suitable for bonding molding materials for the production of steel castings.

Gravity Award—The Gravity Research Foundation has announced its 1956 program of Awards for Essays on Gravity. The awards, the first to be $1000, will be made on June 1 for the best 1500-word essays on the possibilities of discovering some partial insulator, reflector or absorber of gravity; or some alloy, or other substance, the atoms of which can be agitated or rearranged by gravity to throw off heat; or some other reasonable method of harnessing, controlling or neutralizing gravity. Further information may be obtained from: Gravity Research Foundation, New Boston, N. H.

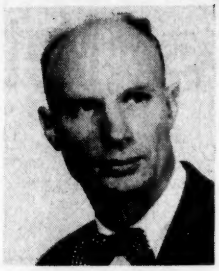
A.S.M.'er Receives Austrian Award

Shown Is the Austrian Consul General in New York City, Heinrich Count Calice (Right), Presenting One of Austria's Highest Decorations in the Field of Technical Science, the Whilhelm Exner Medal, to Paul Schwarzkopf, ASM, President of Schwarzkopf Development Corp. and the Metallwerk Plansee in Reutte, Austria. Dr. Schwarzkopf received the medal in recognition of his many contributions to Austria's industrial and technical development

Meet Your Chapter Chairman

J. H. Jackson

E. J. Schwetz



P. E. Goettsch

COLUMBUS

J. HARRY JACKSON is a native of Troy, New York, and was graduated from Rensselaer Polytechnic Institute in 1936. He worked at the Caterpillar Tractor Co., Peoria, Ill., as a welding and metallurgical engineer and went to Battelle Memorial Institute as a research engineer in 1941.

In 1949, Mr. Jackson was made a research supervisor in a physical metallurgy division at Battelle where he was responsible for investigations on high-temperature materials and on light metals and titanium. A new department of metallurgy was formed at Battelle in June 1953, which incorporated ten divisions of research in this field and Mr. Jackson was named manager of the department.

He is currently serving as chairman of the Titanium Committee of the Institute of Metals Division of A.I.M.E. He holds memberships in several technical organizations and has presented many papers before technical societies.

Mr. Jackson and his wife Marian have three children, Elizabeth, age 13, Anne, 10, and John, 7. His hobby is golf and he spends most of his free time indulging in this sport.

PHOENIX AREA

EUGENE J. SCHWETZ was born in Chicago and attended grade and high schools there. After receiving his B.S. degree in mechanical engineering from the University of Illinois, he joined the staff of the National Malleable and Steel Castings Co. as project metallurgist. The project development effected his transfer to Phoenix, where he became chief metallurgist of a newly built subsidiary of National, the Capitol Foundry Co. When this subsidiary was taken into the parent organization, Gene's title became chief metallurgist, National Malleable and Steel Castings Co., Capitol Foundry Division.

Gene is single and has been active in the Phoenix Area Chapter for the last three years. His duties included those of program chairman, secretary and now chairman. He is interested in young men preparing for engineering colleges and is currently assisting a high-school senior in a project for a Westinghouse scholarship.

Gene participated in athletics during his early life and his current interest is in all types of spectator sports as well as hunting, fishing and other outdoor activities. He served with the Air Force for three years during World War II.

BIRMINGHAM

RALPH CARLSON, assistant melting superintendent, American Cast Iron Pipe Co., was born in North Dakota. He graduated from North Dakota State College with a B.A. degree, and went to work as a chemist at the Alabama Ordnance Works of duPont.

Ralph is married and has two boys. He has been active in his chapter of A.S.M. and is a member of American Foundrymen's Society and the N.A.F. He served as a pilot in the Air Force during World War II.

TRI-CITY

PHILLIP E. GOETTSCH was born in Davenport, Iowa, where he attended grade and high schools. After graduation he served for two years during World War II in Africa and Italy with the Air Force. He is presently a metallurgist for the Government laboratory at Rock Island Arsenal, Rock Island, Ill.

Phil is married and has one child. He enjoys such hobbies as photography, woodworking, camping, hunting and fishing.

TULSA

PAUL OGDEN was born in Moberly, Mo., and attended grade and high schools and junior college there. He graduated in 1936 from the University of Missouri with a B.S. degree in mechanical engineering and went to work with Phillips Petroleum Co. From 1939 to 1941 he was associated with his father in the machine tool and electric motor business. The next three years he was an instructor at the University of Missouri, defense training and A.S.T.P. classes. Paul returned to Phillips in 1944 as a metallurgist in their test division. In 1946 he returned to the University where he taught machine tool and metallurgical courses. In 1950 he received his M.S. degree in mechanical engineering and shortly thereafter became an associate professor. During 1951 he accepted his present position as manager of the laboratory branch of the test division of the engineering department at Phillips.

Paul is married and has one daughter. Last year he served as vice-chairman of Tulsa Chapter. He is a member of several technical and service organizations and is serving his fourth year as secretary-treasurer of the Engineers Club of Bartlesville. His hobby is high-fidelity equipment and records.

● presents an annual metallographic exhibit during the National Metal Exposition and gives awards for the best work.

Powder Metallurgy Topic at Oregon

Henry H. Hausner, Manager of Atomic Energy Engineering, Penn-Texas Corp., Presented a Talk on the "Latest Developments in Powder Metallurgy" at a Meeting Held by the Oregon Chapter. Shown are, from left: James P. Bates, vice-chairman; Dr. Hausner; J. E. Gustafson, chairman; and Arthur H. Greisser, publicity chairman. A complete report of this talk can be found on p. 11 of this issue. (Reported by T. B. Mathisen for Oregon)

Cites Advances in Powder Metallurgy At Columbia Basin

Speaker: Henry Hausner
Penn-Texas Corp.

Henry Hausner, manager of atomic energy engineering, Penn - Texas Corp., presented a talk entitled "Latest Developments in Powder Metallurgy" at a meeting of the **Columbia Basin Chapter.** Dr. Hausner delivered this same talk before the Inland Empire, Oregon and Puget Sound Chapters on a circuit speaking engagement of the Northwest Chapters.

The world-wide commercial application of powder metallurgy can be gaged by its utilization in the automobile industry. In the United States automobile industry the method is applied to the production of 6080 different parts, in Europe 20 different parts, and in Russia powder metallurgy methods are used in the tractor industry, but the extent of their use is not known. In the cost-conscious automobile industry, powder metallurgy is replacing other fabrication methods for small parts in cases where its application will eliminate some operations with resultant time saving, cost reduction and scrap loss.

Dr. Hausner outlined the five methods which commercial practice currently employs. All of the methods utilize various combinations of the three basic steps of mixing, pressing and sintering. The hot press method combines the pressing and sintering; another method employs coining, pressing or extrusion for final shaping of the part; sintered carbides are machined before final sintering; and, in a method for combining metals such as tungsten and copper, the high-melting metal is compacted, sintered and then dipped in a melt of the second metal for mixing by capillary action.

In Dr. Hausner's opinion, one of the most important recent developments in powder metallurgy is a new technique not yet mentioned in the literature. The method involves the slip casting of metals, in principle similar to the ceramics process, where the raw material is mixed with water and the water removed by absorption into a plaster of Paris mold. In application to metals, the process calls for four raw materials: metal powder, liquid, an agent to improve the bond of the powder, and a deflocculent to get the powder suspended. This method allows the fabrication of complicated shapes and permits the mixing of metals and nonmetals.

Another important recent trend in powder metallurgy applications is in nuclear engineering. Dr. Hausner postulated that in a metal having a highly distorted lattice radiation, damage effects will be less than in highly ordered lattices, and that a powder metallurgy sample sintered at a low enough temperature to leave disorders randomly distributed should behave well in a neutron flux. In nuclear engineering, powder metallurgy methods are considered in some uses of beryllium, zirconium, thorium and uranium. Zirconium and thorium are easily adapted to powder metallurgy methods. Full density can be achieved with compacts of these materials at temperatures below the melting temperature. Beryllium and uranium offer difficulties; however, ductile beryllium can be produced when vacuum sintering is employed, and uranium having practically theoretical density, is possible by hot pressing at 1125°C. Another advantage of powder metallurgy with respect to nuclear engineering is in alloy formation. Alloys such as uranium and zirconium can be formed without melting and it is possible to minimize gas pickup by the metals. **—Reported by D. P. O'Keefe for Columbia Basin Chapter.**

Reviews Recent Progress in Research

C. H. Junge (Left), Chairman of the Cleveland Chapter, Is Shown Shaking Hands With H. J. Rand, Rand Development Corp., Who Presented a Talk Entitled "What's Ahead". R. A. Long (right), technical chairman, looks on

Speaker: H. J. Rand
Rand Development Corp.

H. J. Rand, president of Rand Development Corp. and H. J. Rand Foundation for Medical Research, and the man who has been called "Inventor Extraordinary", gave the members present at the Sustaining Members Night Meeting of the **Cleveland Chapter** not only a peek at what's to come but the fundamentals of how a research man operates in a talk entitled "What's Ahead".

An inventor or research man cannot operate in a vacuum. Illustrating how secrecy hinders development, Mr. Rand pleaded for greater liberalization among scientists of all nations. The search for new viewpoints is particularly fruitful when we take time to examine those from the other side of the oceans. Our research people should visit Europe just as the Europeans come here for study. One would think that the wheel, a basic human invention, could stand little improvement by now. Yet from Europe comes a new kind of wheel for the automobile, one with rubber diaphragms between the rim and hub that allow the wheel to move laterally instead of up and down, remarkably decreasing the tendency to bounce. Already in use in many European cars, it is being developed by all American auto companies.

Enlarging further on his argument for greater intermingling of research men, Mr. Rand told how often a new concept is introduced by someone out of the field—the fellow looking over your shoulder. He told how a research problem was submitted with the object of checking the viscosity of paint without opening the can. The search for a solution by the men connected with paint problems was fruitless, until a mathematician looked in and came up with the right answer.

In looking ahead to the future, Mr. Rand laid heavy emphasis on the part that will be played by mathematics, data handling devices and automation. In the field of metallurgy, particularly in basic metal production, in spite of heavy and costly installations, automation will find its way.

The speaker is affiliated with the Cleveland section, American Heart Society, and other medical organizations. He described research going on in the fields of heart disease, cancer and other items in medicine. He said the French have conducted research pointing to viruses as the cause of cancer, giving hope that a cancer-killing vaccine can be developed. In his own laboratory, Mr. Rand is working on a new type of cigarette paper. It is reportedly void of paper tar which is said to contribute to lung cancer.—**Reported by J. J. Glubish for Cleveland Chapter.**

spends $44.50 to service each member of the Society for a period of one year.

CHAPTER MEETING CALENDAR

CHAPTER	DATE	PLACE	SPEAKER	SUBJECT
Albuquerque	Mar. 30	LaFonda Hotel	A .O. Schaefer	A.S.M. of Tomorrow
Baltimore	Apr. 16		Plant Visit	
Boston	Apr. 6	M.I.T. Faculty Club	J. T. Norton	Sauveur Memorial Lecture
Calumet	Apr. 10	Phil Smidt	O. W. McMullan	Case Hardened Steels
Canton-Massillon	Apr. ..	Mergus Restaurant	A. O. Schaefer	Steel Forgings
Carolinas	Apr. 15	Raleigh	F. C. Kelley	Powder Metallurgy
Chattanooga	Apr. ..	Maypole Restaurant	John F. Black	
Chicago	Apr. 9	Furniture Mart	K. Haagenson	Human Side of Our Business
Chicago-Western	Apr. 16	Furniture Mart	Norman Deuble	Vacuum Melting of Molybdenum
Cleveland	Apr. 3	Hotel Hollenden		Student Affairs Night
Columbia Basin	Apr. 17		R. P. Turner	Nondestructive Testing
Columbus	Apr. 18	Columbus		Tri-Chapter Meeting With Cincinnati and Dayton
Detroit	Apr. 9		Mars Fontana	Metallurgical Factors in Corrosion
Eastern New York	Apr. 10	Panetta's		Joint Meeting—ASM-AFS
Fort Wayne	Apr. 9	Hobby House	William Reich	Metallurgy of Vacuum Metals
Hartford	Apr. 10	Indian Hill Country Club	R. S. Nycum	Titanium
Indianapolis	Apr. 16		A. E. Nehrenberg	TTT-Curves in Practical Heat Treatment
Jacksonville	Apr. 9	Parker & Mick Machine Works	W. O. Manly	Materials Problems in Nuclear Reactors
Lehigh Valley	Apr. 6	Hotel Traylor	J. Sullivan	Statistical Methods in Metals Industry
Los Alamos	Apr. 30	Albuquerque	A. O. Schaefer	A.S.M. of Tomorrow
Los Angeles	Apr. 26	Rodger Young Auditorium	J. P. Howe	High-Temperature Alloys in Jet Engine Construction
Mahoning Valley	Apr. 10	V.F.W.	M. H. Mawhinney	Industrial Furnaces of Today
Milwaukee	Apr. 17	City Club	John Pearson	Fracturing of Metals Under Explosive Loads
Montreal	Apr. 3	Queen's Hotel	J. E. Burke	Metallurgical Problems in the Use of Atomic Energy
Muncie	Apr. 10	Muncie	A. Amorosi	Atomic Power
New Haven	Apr. 19	Waverly Inn	J. Wambold, Jr.	Ceramic Coatings
New Jersey	Apr. 16	Essex House	J. W. Gulliksen	Press Working of Sheet Metals
New Orleans	Apr. 4		E. S. Rowland	Practical Applications of Physical Metallurgy
New York	Apr. 9	Hotel Victoria	F. Damara	Vacuum Melting
Northeast Pennsylvania	Apr. 12	Irem Temple Country Club	H. Etherington	Atomic Reactors
Oak Ridge	Apr. 18	K. of C. Hall	A. O. Schaefer	Forged Pressure Vessels
Oregon	Apr. 26	Congress Hotel		Ladies Night
Ottawa Valley	Apr. 3	P.M.R.L.	David Turnbull	Formation of Crystal Nuclei in Liquid Metals
Penn State	Apr. 10	Mineral Sciences Auditorium	W. W. Wentz	Physical Metallurgy and Metallography of Titanium and Its Alloys
Peoria	Apr. 9	New Legion Building	R. H. Aborn	Low-Carbon Martensites
Philadelphia	Apr. 27	Penn Sherwood	R. B. Mears	Designing for Corrosion Control
Jr. Section	Apr. 9	Engineers Club	R. R. Moore	Metal Failures—Their Causes and Correction
Phoenix	Apr. 21		Social	Ladies Night
Pittsburgh	Apr. 12	Gateway Plaza	Panel	Solidification of Metals
Puget Sound	Apr. 11	Engineers Club		Corrosion in Action
Purdue	Apr. 28	Memorial Union		Symposium
Rhode Island	Apr. 4	Johnson's Hummock	Panel	Tools and Dies Made of Plastics
Rochester	Apr. 9	Howard Johnson's	John Given	Control of Heat Treating Operations
Rockford	Apr. 25	Faust Hotel	N. W. Schubring	ABC's of Ultrasonic Inspection
Rocky Mt.	Apr. 20	Oxford Hotel	Social	Ladies Night
St. Louis	Apr. 20	East Alton	Plant Tour	Western Brass Mills
Saginaw Valley	Apr. 17	Fischer's	W. W. Hintalla	Process Metallurgy for Rolling Steel
Springfield	Apr. 16	Hotel Weldon, Greenfield	N. I. Stotz	High Speed Steels
Syracuse	Apr. 3	Onondaga Hotel	L. E. Gibbs	Using Copper Alloys
Texas	Apr. 3	Ben Milam	A. O. Schaefer	Manufacture and Heat Treatment of Forgings
Tri-City	Apr. 10	Rock Island Arsenal	F. W. Witzke	Surface Finish Control
Tulsa	Apr. 3	Alvin Plaza	Howard Scott	Factors Determining Strength of Metals
Washington	Apr. 9		F. H. Spedding	Physical Metallurgy of Rare Earth Metals
Western Ontario	Apr. 14	Windsor		Aluminum Pistons
Worcester	Apr. 11	Hickory House		Processes and Applications of Metallizing
York	Apr. 11	Gettysburg	C. R. Sutton	Atomic Energy and Metallurgy

Nature of Corrosion Of Metals Outlined At New York Meeting

Speaker: Francis L. LaQue
International Nickel Co., Inc.

Francis L. LaQue, vice-president and manager of the development and research division, the International Nickel Co., Inc., spoke on the "Nature of Corrosion of Metals" at a meeting in **New York.**

Mr. LaQue pointed out that the greatest problem area in this field is rarely that of general corrosion. The real trouble begins with pitting and crevice attack, stress-corrosion cracking, velocity effects and galvanic action. These kinds of corrosive attack frequently do more damage than general over-all corrosion.

Pitting and crevice attack usually involve corrosion cells, namely concentration cells. Mr. LaQue illustrated this type of cell and its action by means of a series of slides. It was shown that current will flow by virtue of the difference in the metal ion concentration within the cell. Another type cell which causes more trouble is the differential aeration cell where corrosion occurs at the point of low oxygen concentration. These types of cell were clearly shown to operate at crevices where, in one illustrated case, the metal concentration was low on the outside and the metal adjacent to the crevice was attacked. Another illustration showed the attack to occur within the crevice where the oxygen concentration was low. Crevices can be formed under washers, gaskets, packing and loosely adhering deposits.

Tests designed to evaluate the pitting resistance of metals should incorporate specimens of sufficient size to offer sufficient area for pitting to occur. For example, stainless steel will develop a number of pits per given area per time in a given environment. A plot showing the depth of pit versus area outside a crevice was demonstrated to be a straight line. Thus, once a specimen has been chosen, the depth of pitting which can occur is fixed. Small specimens limit the maximum attack whereas large specimens give more opportunity for maximum attack to occur to its fullest. In addition to the size effect, the incidence or frequency of attack must be considered in the selection of the number of specimens to be subjected to the corrodent.

Mr. LaQue showed by means of test data that the effect of the type of finish on a specimen in promoting or diminishing corrosion may lead to erroneous conclusions. The data revealed that a mirror finish on Type 304 stainless steel specimens exposed to a solution of ferric chloride and dilute hydrochloric acid produced 2 pits where a pickled finish showed 20 pits. When figured on a weight loss basis, the mirror-finished specimen lost 330 mg. in 2 pits, and the pickled-finish lost 1820 mg. in 20 pits. These data are valid in that the two pits in the mirror-finished specimen acted as anodes for the same area where 20 pits in the pickled-finished specimen were the anodes. Figured on a weight loss per pit, the mirror-finished specimen lost more weight and suffered deeper pitting.

Another variable in the testing technique mentioned was the position of the specimen in the corroding solution. It was found that the specimens in the vertical position did not corrode as severely as those which were in the flat position.

Mr. LaQue went on to discuss the effects of welding on stainless steels. It is common knowledge that certain grades of stainless steels become sensitized and susceptible to intergranular corrosion in an attacking solution. The people who conduct tests to determine the effects of welding stainless steel fail to evaluate the results of sensitization tests properly. One outstanding question should be asked in this respect. Does welding cause sensitization to promote attack in a particular environment? The answer to this question should be found in a simple way so as to evaluate the effects of welding. Tests should be performed on both welded and unwelded specimens and in the sensitized condition. These tests may show that sensitized welded specimens are no more susceptible to attack than unwelded sensitized specimens. This point was illustrated by data of tests conducted on Type 304 stainless steels in various solutions. An important point to consider in such tests is the application of solutions which are to be used in actual plant service.

Mr. LaQue emphasized the fact that the pure effects of stress are, in his opinion, a minor factor in corrosion. Stress-corrosion can come about by the preferential attack of particular phase; whether stress causes this precipitation is doubtful. Some materials will crack intergranularly and/or transgranularly under the same stress conditions depending upon the impurities present in the corrodent.

As a final topic on corrosion, Mr. LaQue spoke on velocity effects. He illustrated the test methods employed to bring out the velocity effects on various materials. The method illustrated consisted of rotating disks of material in a corrodent at varying speeds. The results of these tests can vary with disk diameter and speed. For example, with high disk velocities steel becomes more noble whereas the reverse is true for copper. The reason for this effect is that higher speeds cause more oxygen to become entrapped in the solution and thus cause the steel to become more passive.

Jet impingement tests, another form of testing velocity effects, were discussed. In this type of test, the size of specimen is an important variable. The common belief is that jet velocity and solution are the important factors to be considered. Mr. LaQue warned that these tests are not reliable.

In closing, Mr. LaQue advised that if good corrosion data are required, tests should be conducted under actual operating conditions.—**Reported by A. V. Alessandria for New York.**

Editor Outlines A.S.M. Plans for Future and *Metal Progress* Policies

Speaker: John F. Tyrrell
Metal Progress

At a meeting of the **Rockford Chapter,** John Tyrrell, associate editor, *Metal Progress,* presented a talk entitled "Metal Progress".

Prior to discussing the magazine, Mr. Tyrrell discussed the A.S.M. in relation to its type of member, its growth and its growth policy on the national level. Since 97% of the metallurgists in the country already belong to the A.S.M. but make up only 30% of its members, growth of the society will depend on attracting new members whose jobs require engineering information on the selection and fabrication of metals even though they have no formal metallurgical training. The A.S.M. of Tomorrow, the long-range, five-point plan for the A.S.M. was explained. Mr. Tyrrell discussed plans for the new headquarters building, the establishment of the Metals Engineering Institute, holding of metallurgical seminars, establishment of a Metals Research Laboratory to bridge the gap between industrial and university-level laboratories, and the establishment of a Metal Science University. The first three points have already been approved by the Trustees. A suburban site for the new headquarters will be selected by the Trustees within the next few months and the building should be completed by 1958. Forty-one correspondence courses are now being prepared by the Metals Engineering Institute. Four or five of these will be ready for preliminary field testing in the Spring and the others will be released at regular intervals thereafter.

Mr. Tyrrell then presented a discussion of the magazine *Metal Progress.* He gave a short history of the magazine and explained its editorial policies. He covered the problems the staff has in respect to a publication that has such a wide field to cover as well as the various fields of interest covered and how the articles are selected for publication.—**Reported by D. R. Adolphson for Rockford Chapter.**

Albuquerque Members Tour Anaconda

One of the Two Groups of Albuquerque Chapter Members and Students Who Toured the Facilities of the Anaconda Uranium Mill at Bluewater, N. M., Is Shown in the Mill Yard. In front, wearing the light-colored trousers, are F. S. Cooke (left), assistant mill superintendent, and G. U. Greene, A.S.M.

A field trip to the Anaconda Uranium Mill at Bluewater, N. M., was enjoyed by members of the **Albuquerque Chapter** and students from the New Mexico Institute of Mining and Technology.

Gerald U. Greene of the School of Mines faculty sponsored the student group, composed of members of the A.S.M. student chapter or affiliated with A.I.M.E.

Members and guests, including R. P. Lutz, vice-president, and R. J. Hansen, superintendent, Sandia Corp., motored to the mill properties located 12 miles west of Grants, N. M. They were welcomed to Anaconda by F. S. Cooke, assistant superintendent, and Mr. Marshall, safety engineer. The group visited the wet chemical laboratory and the radiometric room where ore samples were being analyzed for radio-activity. It was pointed out by the guides that uranium-bearing ores of the carnotite or roscoelite type, containing as little as 1/10 of 1% uranium oxide, are bought by the A.E.C. or its authorized purchasing agents.

Following a look at the weighing, sampling and assaying of ores, the group viewed the rod and ball crushing mills and then toured the acid leach, the carbonate leach, and the ion exchange process plants.

In the interest of economy the plant makes its sulfuric acid from native sulfur that is shipped in. Large quantities of the acid are used in treating the sandstone uranium ores. The carbonate leach plant processes ore requiring the removal of lime (calcium carbonate). Three wells on the Anaconda property supply the necessary water for steam purposes and for ore washing and dressing.

A look at the end product known as "yellow cake", a brilliant orange colored salt residue of U_3O_8, concluded the tour.

Tonnage figures regarding uranium production are restricted by the A.E.C., but the value of this metal produced in the state of New Mexico in 1955 amounted to $4,680,906, an increase of 35% over 1954's valuation. Late in 1955 Anaconda completed an acid leach plant at Bluewater where standstone uranium ores now shipped direct from the company-operated Big Jackpile Mine via a recently installed railroad spur track are processed. Large increases in production are anticipated as a result of these improvements. At the present time some 500 persons are employed at the mill on an around-the-clock basis.—**Reported by Ben F. Blythe for Albuquerque.**

Tour Westover Air Base

The **Springfield Chapter,** led by the chairman, L. Brewster Howard, superintendent of the American Saw and Manufacturing Co., visited Westover Air Force Base, just outside Springfield, during a recent meeting. The group was welcomed by Lt. Col. Walter Callahan, director of maintenance.

Colonel Callahan gave an interesting talk on the care and maintenance of all planes on the base including the KC-97 tanker plane. Following the talk, the group was escorted around the Base by officer guides, and was shown through the engine and fabric shops and the maintenance dock.

Following the inspection trip the entire group had dinner at the Officers' Club and heard a talk by Lt. Col. D. G. Burgeson, director of materiel of the 4050th Air Refueling Wing. Colonel Burgeson discussed the missions of the Strategic Air Command and of Westover Air Force Base. This was followed by an interesting question and answer period. **—Reported by Carl A. Keyser for Springfield.**

Ladies Visit Western Electric

The Ladies Night meeting of the **Indianapolis Chapter** featured a tour of the Western Electric Co., which produces telephones and equipment for the Bell Telephone Co.

Members and their ladies were given an opportunity to see the molding and finishing of telephone cases, ssembling of parts to make a finished telephone, making and assembling of explosion-proof phones, making of parts that go into a phone, testing of completed assemblies, checking of incoming material, and packaging and shipping of the finished product.

The meeting was concluded with a fried chicken dinner served in the plant cafeteria.—**Reported by Dorothy Holbrook for Indianapolis.**

Phoenix Area Sees Tool Exhibit

Phoenix Area Chapter Heard C. G. Schelley, Managing Director of the Wilkie Foundation, Present a Talk and Exhibit Entitled "Civilization Through Tools" at a Recent Meeting. Shown are, from left: Eugene Schwetz, Chairman of the Chapter, and Mr. Schelley. (Reported by D. A. Rich for Phoenix)

Materials Problems of Nuclear Reactors Are Explained at Penn State

Speaker: W. D. Manly
Oak Ridge National Laboratory

At a meeting held by **Penn State Chapter,** W. D. Manly, associate director, metallurgy division, Oak Ridge National Laboratory, discussed "Material Problems in Nuclear Reactors".

Mr. Manly pointed out that although there are many possible materials which can be used in the basic parts of a reactor, only a few have proved to be practical. The use of materials is beset by complex problems, many of which are metallurgical in nature. In many cases, the selection of a material is governed by a balance between nuclear requirements, properties and cost.

A discussion of a hypothetical reactor for an automobile served to illustrate the many problems associated with the construction of a nuclear reactor. This also served to illustrate the compromises which must be made concerning fuel elements, moderators, controls, cooling systems, shields and structural parts.

Mr. Manly pointed out that a serious problem is corrosion in the cooling system, as exemplified by the mass transfer of nickel to the cooler regions from the tubing walls in the hot regions. This phenomenon is the result of the corrosive nature of certain circulating coolants. Fabrication of heat transfer components is another serious problem. No. leaks can be tolerated, so that brazing and welding of tubing are considered critical operations.

Colored slides of the X-10 graphite reactor which has been in use at Oak Ridge were shown.—**Reported by Ralph G. Dermott for Penn State.**

Chicago-Western Group Plans All-Day Meeting At Argonne Laboratories

The **Chicago-Western Group** of the Chicago Chapter will have an all-day meeting at the Argonne National Laboratory, Lemont, Ill., on Monday, Apr. 2. The morning session will be devoted to a symposium on "Gases in Metals". Speakers will be William M. Baldwin, research professor, Case Institute of Technology, Lawrence S. Darken, U. S. Steel Corp. Research Laboratories, and S. S. Sidhu, metallurgy division, Argonne National Laboratory. The discussion will be led by Robert M. Brick, director, metallurgical research laboratory, Continental Can Co., moderator of the session.

In the afternoon those attending the meeting will have an opportunity to visit certain laboratories and facilities at Argonne, including the research reactor, the metallurgy hot laboratory and the metallurgy research laboratories. Special experiments will be running in each location, designed to show representative activities of the laboratory. In addition, remote machining operations, and remote preparation, polishing, etching and photographing of metallographic specimens will be observed in the hot laboratory. Dr. Sidhu's neutron diffraction apparatus for the study of gases in metals will be in operation. After the tour, time will be given for further discussion of the subject matter of the morning session and the various phases of the tour.

In the evening there will be a dinner at Argonne after which A. B. Kinzel, president, Union Carbide and Carbon Research Laboratories, will give the closing address of the session. It is expected that the Chicago-Western Group will be chartered as an independent chapter at the evening session.

Attendance at these meetings is open to American citizens. Registration is being handled by a committee headed by James F. Schumar, Associate Director, Metallurgy Division, Argonne National Laboratory, Lemont, Ill. All those wishing to attend should write to Dr. Schumar for registration forms.

Past President Speaks in Syracuse

Past National President George A. Roberts, Vice-President-Technology, Vanadium-Alloys Steel Co., Spoke on "New Developments in Toolsteels" at a Meeting of Syracuse Chapter. From left: Daniel C. Williams, who presented the coffee talk; Fred Hunter, chairman; Dr. Roberts; and John F. Tyrrell, associate editor, Metal Progress, *representing ASM headquarters*

Speaker: G. A. Roberts
Vanadium-Alloys Steel Co.

An enthusiastic group of metals engineers, heat treating personnel, toolsteel men, sales people and metallurgists, a representative cross-section of Central New York business men with metal interests, was recently treated to a diversified program held by the **Syracuse Chapter** which covered subjects ranging from milk to technical papers and toolsteels.

Highlighting the activities of the evening was an address presented by George A. Roberts, vice president—technology, Vanadium-Alloys Steel Co. Dr. Roberts, past national president A.S.M., spoke of "New Developments in Toolsteels". Reviewing the toolsteel business over the past two decades, he outlined the trends in the use of steels for tooling purposes. In an interesting and informative manner, Dr. Roberts pointed out the growth of the toolsteel industry through the years from 1940 to 1956. He showed that buying habits in toolsteels have changed steadily from carbon toolsteels to alloy toolsteels. The quantity of toolsteels in use today related to the quantity of tonnage steel produced was shown to have decreased, and this decrease was attributed mainly to the consumer demand for and use of the better-grade alloy and high speed toolsteels to replace carbon toolsteel.

Dr. Roberts aroused much interest with his metallographic demonstration and metallurgical explanation of the "heat-check" failure of hot-work toolsteels in use as aluminum die-casting dies, and with his views on the present use and the proposed use of the free-machining varieties of toolsteels.

John F. Tyrrell, associate editor of *Metal Progress,* presented a progress report on the Society and then explained the process by which the editors select articles for publication in *Metal Progress.* As a result of editorial research and a reader survey, the magazine content is to be balanced by concentrating on 19 most-wanted subjects. Mr. Tyrrell expressed a plea for reader donations of seemingly minor personal improvements in materials and processes, these improvements being wholly practical in nature and possibly being the answer to another reader's immediate problem.

Rounding out an informative evening was Daniel C. Williams, the coffee speaker. Mr. Williams, formerly a patent attorney for a Syracuse metalworking company, is now general council for the Eastern Milk Producers' Cooperative Association. His talk, covering the plight of the dairyman, was an interesting diversion from things metallurgical.—**Reported by L. Zakraysek for Syracuse.**

Speaks on Free Machining Steels

At a Joint Meeting of the Dayton Chapter, the American Society of Lubrication Engineers and the National Screw Machine Products Association, George Enzian, Jones and Laughlin Steel Corp., Presented a Talk Entitled "Free Machining Steels and Machinability From a Metallurgical Perspective". Shown are, from left: Harold Reindl, Dayton chairman; Mr. Enzian; Walter Hulse, Dayton district representative, Jones and Laughlin Steel Corp.; and Glenn Stockmeier, a member of Dayton Chapter executive committee

Speaker: George Enzian
Jones & Laughlin Steel Corp.

The **Dayton Chapter** heard a talk on "Free Machining Steels and Machinability From a Metallurgical Perspective" by George Enzian, assistant director of the technical services division, Jones and Laughlin Steel Corp., at a joint meeting with the American Society of Lubrication Engineers and the National Screw Machine Products Association.

Mr. Enzian divided his talk into three sections: Mechanical factors involved in metal cutting; metallurgical control of factors affecting machinability; and review of current research work on free machining steels. He pointed out the relationship of the metal chip thickness and the length of the metal shear path. It was shown that a thick chip results in a long shear path and causes poor tool life. Chip types were listed as being discontinuous, continuous ribbon type and continuous with a built-up edge. The type of chip obtained is usually associated with the characteristics of the metal being machined. Cast iron was given as an example of a brittle material which produces a discontinuous chip which ruptures along the shear plane and breaks into small pieces. Mr. Enzian stated that relationships between mechanical properties and machinability ratings can only be rough approximations because the pertinent properties involved are dynamic in nature and are changing during cutting. The term machinability is only relative and all aspects of the problem cannot be evaluated by one pilot test.

The effect of the alloy content of a steel in relationship to microstructure and to machinability characteristics was discussed. The speaker said that elements such as nickel and copper strengthen the ferrite with little loss in ductility and, in general, will decrease the machinability. The general effect of alloys is to decrease machinability by imparting hardness and toughness to the steel, but aluminum and silicon are objectionable due to the abrasiveness of their oxide compounds. Sulphur is desirable and both the oval and stringer type sulphides promote good cutting qualities. Phosphorus embrittles ferrite and has a mild effect in increasing machinability. Carbon was shown to have its maximum effect in producing machinability in steel when the pearlite content is approximately 35%. In plain carbon steels this is obtained at about 0.25 to 0.30% carbon. Higher carbon contents increase the amount of pearlite in the ferrite matrix which is accompanied by a hardness gain and thereby a decrease in cutting quality.

Leaded steels were discussed and shown to give approximately 20 to 30% machinability gain over the normal expectancy of the comparable nonleaded grades. Lead was said to have little effect on a steel other than increasing its machinability. A slight grain refinement has been noted from its use along with a slightly lower transverse toughness in large sections. The lead addition was pictured as a dispersed submicrostructure precipitate and provides the steel with an internal lubricant. It is still debatable as to whether the lead exists in the steel as a metallic lead or as a compound.

The importance of oxygen control in steelmaking was mentioned. Tests have shown that oxygen increases the machinability of steel. Present investigation of this problem is being made by Jones and Laughlin. **—Reported by Walter J. Ridd for Dayton Chapter.**

Welded Ship Failure Subject At A.S.M.-A.W.S. Meeting

Speaker: W. J. Harris, Jr.
Battelle Memorial Institute

William J. Harris, Jr., Battelle Memorial Institute, addressed a joint meeting of the **Washington Chapter** A.S.M. and the American Welding Society on "Failures in Welded Ships".

The rate of failures in both Liberty and Victory ships was discussed. Dr. Harris pointed out that during the period from 1943 to 1954 the casualties due to these failures plus the research program to find the cause and cure cost a total of $96,000,000.

Dr. Harris included a brief historical review of the early investigations into welded ship failures at the National Bureau of Standards.

It has been shown that changes in composition considerably affect the transition temperature of the steels. This has led to the use of steels with lower carbon and higher manganese contents for ship hulls.

Dr. Harris concluded by stating that the problem of welded ship failures has been virtually solved by the various research investigations of the problem.—**Reported by H. P. Weinberg for Washington Chapter.**

Saginaw Honors 25-Year Members

T. E. Leontis, Left, Chairman of the Saginaw Valley Chapter, Is Shown With F. L. Mackin, Center, and M. H. Medwedeff, Right, Who Were Recently Presented With 25-Year Membership Certificates by the Chapter

IMPORTANT MEETINGS

for April

Apr. 4-6—American Society of Lubrication Engineers. Annual Meeting and Exhibit, William Penn Hotel, Pittsburgh. (W. P. Youngclaus, Jr., Secretary, A.S.L.E., 84 E. Randolph St., Chicago 1.)

Apr. 4-7—National Screw Machine Products Association. Annual Meeting, Schroeder Hotel, Milwaukee. (O. B. Werntz, Executive Vice-President, N.S.M.P.A., 2860 E. 130th St., Cleveland 20.)

Apr. 8-12—Scientific Apparatus Makers Association. Annual Meeting, Belleview-Biltmore, Belleair, Fla. (Kenneth Andersen, Executive Vice-President, S.A.M.A., 20 N. Wacker Dr., Chicago 6.)

Apr. 9-11—American Institute of Mining and Metallurgical Engineers. National Openhearth Committee Meeting, Netherland Plaza Hotel, Cincinnati. (E. O. Kirkendall, Secretary, A.I.M.E., 29 W. 39th St., New York 18.)

Apr. 10-12—Metal Powder Association. Annual Meeting, Hotel Cleveland, Cleveland, Ohio. (R. L. Ziegfeld, Secretary, M.P.A., 420 Lexington Ave., New York 17.)

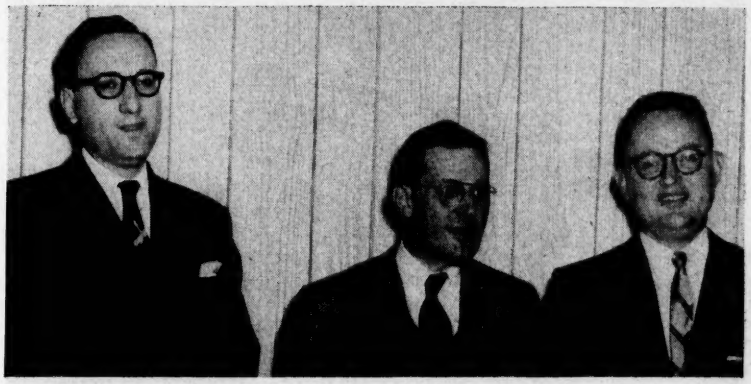
Apr. 22-26—American Ceramic Society. Annual Meeting, Hotel Statler, New York. (C. S. Pearce, Secretary, A.C.S., 4055 N. High St., Columbus 14, Ohio.)

Apr. 23-25—American Zinc Institute and Lead Industries Association. Combined Annual Meeting, Hotel Statler, St. Louis. (R. L. Ziegfeld, 420 Lexington Ave., New York 17.)

Apr. 29-May 3—Electrochemical Society. Spring Meeting, Mark-Hopkins Hotel, San Francisco. (R. M. Burns, Secretary, E.S., 216 W. 102nd St., New York 25.)

Apr. 30-May 2—Metal Treating Institute. Spring Meeting, Roosevelt Hotel, New Orleans. (C. E. Herington, Secretary, M.T.I., 271 North Ave., New Rochelle, N. Y.)

Mahoning Holds Openhearth Night



D. W. Murphy, Research Engineer, Bethlehem Steel Co., Spoke on the "Flow of Gas and Air in Openhearth Regenerators" at the Openhearth Night Meeting Held by the Mahoning Valley Chapter. Shown are, from left: John Stukel, technical chairman; Mr. Murphy; and P. T. Kelley, chairman

Speaker: D. W. Murphy

Bethlehem Steel Co.

The annual Openhearth Night Meeting of the **Mahoning Valley Chapter** featured a talk on the "Flow of Gas and Air in Openhearth Regenerators" by D. W. Murphy, research engineer, Bethlehem Steel Co.

Mr. Murphy pointed out that the flow of waste gas and air is concentrated on opposite ends of the regenerators so that approximately 70% of the gas is used to heat only approximately 15 to 30% of the air in the present type of design of checkers. Due to high cost it is not practical to experiment with an operating furnace and therefore it is planned to use model furnaces for future experiments. A smaller cross section and deeper checker and a change in air intake parts are possible improvements discussed by the speaker.—**Reported by A. J. Fletcher for Mahoning Valley.**

Cleveland Members Visit Aluminum Co. Facilities

Speaker: J. H. Dunn

Aluminum Co. of America

A record number of **Cleveland Chapter** members turned out at a recent meeting to see Aluminum Co. of America's 50,000-ton heavy press. A guided tour of the company's plant was followed by a short instructive movie entitled "This Is Aluminum".

J. H. Dunn, manager, development division, presented a talk entitled "Aluminum Alloys in the Automotive Industry". He started with the question, "How much aluminum is in an average car?" and went on to compare the first "car of the future", that came out in 1938, which was all steel, with the second "car of the future", which came out in 1949, and which was almost all aluminum and magnesium. Mr. Dunn then described some of the specific uses of aluminum in today's cars. He estimated that an average of 30 lb. is used in a 1955 model passenger car, which is considerable in light metal tonnage figures. Mr. Dunn predicted that approximately 301 lb. is possible.

The speaker then discussed in detail aluminum pistons. He illustrated with slides how expansion problems are taken care of by design details and alloying. He also described how the program was carried out in the development of aluminum die cast clutch housings. He discussed the development of other parts, including the aluminum wheels used in the 1953 Motorama and now being used on some 1956 cars.

Mr. Dunn concluded with a discussion of the future uses of aluminum. He predicted the aluminum radiator and showed some of the fabrication methods.—**Reported by J. J. Glubish for Cleveland Chapter.**

Technical Papers Invited for A.S.M. Transactions

The Publications Committee of the A.S.M. will now receive technical papers for consideration for publication in the 1957 *Transactions* and possible presentation before a national meeting of the Society. A cordial invitation is extended to all members and nonmembers of the A.S.M. to submit technical papers to the Society.

Many of the papers approved by the Committee will be scheduled for presentation on the technical program of the 38th National Metal Congress and Exposition to be held in Cleveland Oct. 8-12, 1956. All papers that are accepted will be preprinted. Manuscripts should be received at A.S.M. headquarters office not later than April 2, 1956.

Acceptance of a paper for publication does not necessarily infer that it will be presented at the annual convention. The selection of approved papers for the convention program will be made early in June.

Manuscripts in triplicate, plus one set of unmounted photographs and original tracings, should be sent to the attention of Ray T. Bayless, assistant secretary, American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

Should it be your intention to submit a paper, please notify A.S.M. A copy of the booklet entitled "Suggestions to Authors in the Preparation of Technical Papers" will be gladly forwarded. This booklet may help considerably in the preparation of line drawings and illustrations.

Gives Titanium Outlook at Chattanooga

From Left: Jack Stocker, Chairman, Donald J. McPherson, Armour Research Foundation, Who Gave a Talk on the "Outlook for Titanium", Julian Glasser, Chapter Technical Advisory Committee Chairman, and John Buskie, Vice-Chairman, Are Shown at a Recent Meeting of Chattanooga Chapter

Speaker: Donald J. McPherson
Armour Research Foundation

The **Chattanooga Chapter** heard a talk on the "Outlook for Titanium" by Donald J. McPherson, assistant manager, metals research department, Armour Research Foundation of Illinois Institute of Technology.

Titanium has opened up a new family of alloys for potential use in aircraft, railway equipment, truck and bus bodies, tanks, and other structural uses where the strength to weight ratio of material is an important factor.

Titanium is readily available, being the fourth most available metal in common use. Its oxide, rutile, is its most convenient source. But titanium is very difficult to separate from the oxide and very reactive during various stages of its separation. After being separated and obtained in the form of sponge, titanium must be melted in a vacuum or inert atmosphere since it readily absorbs gases which render it impure. These difficulties in extraction and purification have kept the price of titanium high, and the future of titanium in civilian fields, at least, will depend on lowering the price from a present $3.45 per lb. for sponge to something less than $1 per lb.

In the fields where military and defense needs make the price of secondary importance, titanium gives us a metal and alloys which compare very favorably with other alloys in strength to weight ratios. It keeps this strength at moderately elevated temperatures; the 8% manganese alloy, for example, has an 87,000-psi. strength at 800° F. and the 4% aluminum, 4% manganese alloy has a 100,000-psi. strength at the same temperature. There are some titanium alloys which show good stress stability—that is, they are not brittle after stress at high temperature.

Titanium and its alloys have good corrosion resistance to sea water which should increase the use in ships.

When production uniformity and methods bring the price of titanium down, the outlook for its future is good in those civilian fields where reduction in dead weight for greater pay load is an important factor.—**Reported by J. H. McMinn for Chattanooga Chapter.**

Flame Hardening Method Is Illustrated at Texas

Speaker: M. R. Scott
Detroit Flame Hardening Co.

M. R. Scott, president of the Detroit Flame Hardening Co., presented a talk on "Flame Hardening—Its Scope and Applications" in **Texas.**

Flame hardening is not a cure-all type of heat treating, but has certain applications where other types are not at all satisfactory. Many of these applications were illustrated with slides, including the flame hardening of the surfaces of cast iron rolls, gear teeth on various external-type gears and selective hardening of dies. Mr. Scott emphasized that flame hardening is not achieved by indiscriminate use of a welding torch. The successful use of flame hardening depends on a very carefully developed and controlled technique. It can be useful for selective hardening of large parts, including gears and rolls for the paper and steel industries. It would be impossible, or at least impractical, to furnace harden these objects. Also, warpage can be controlled or eliminated, provided the flame hardening technique itself is properly controlled.—**Reported by D. F. Saurenman for Texas Chapter.**

Magnetic Materials Described at York

T. O. Paine, Manager, Measurement Laboratory, General Electric Co., Spoke on "Magnetic Materials" at a Meeting of York Chapter. He is shown, center, with Leon Hurwitz, left, and J. Carey, Jr., program committeeman

Speaker: T. O. Paine
General Electric Co.

York Chapter members heard T. O. Paine, manager, measurement laboratory, General Electric Co., present a talk giving a fundamental view of "Magnetic Materials".

Dr. Paine pointed out that the science of magnetism has caught up with the uses of magnetic materials. Now scientists and engineers can predict magnetic characteristics from fundamental considerations. He reviewed current magnetic theory, explaining that now even pure iron can be made permanently magnetic.

In engineering a magnet, it is necessary to consider physical shape and size, materials to be used and functional use as combining factors.

After the talk on magnetic materials, Dr. Paine showed colored motion pictures of the growth and recrystallization of mercuric iodide crystals. It was a most beautiful demonstration of grain refinement and crystal growth in the solid state as seen through the microscope.—**Reported by Charles Walter for York.**

Gives Pointers on Use of Emergency Metallurgy in Peacetime at Des Moines

Speaker: A. O. Schaefer

Midvale Co.

At the National Officers Night meeting held by **Des Moines Chapter**, A. O. Schaefer, vice-president in charge of engineering and manufacturing, Midvale Co., and president A.S.M., spoke on the "Application of Emergency Metallurgy to Peacetime Uses".

Mr. Schaefer prefaced his talk with a brief discussion of his observations in Europe and enumerated some of the differences in the industries of the various countries. He also commented on the fact, or at least what appears to be a fact, that an emergency period provides the impetus to more rapid progress and greater developments than experienced normally, due largely to the greater demands for new materials and new products. Since the metals industry is directly or indirectly connected with every phase of existence, it experiences a greater than ordinary advancement during an emergency period. Of these developments, many new materials and products are carried over into the subsequent peacetime period.

Mr. Schaefer specifically discussed one of these developments, the ultrasonic inspection of the rotor disk forgings for the I-40 jet engine. Magnetic methods and the associated methods using a fluorescent powder had failed to reveal the internal bursts or cracks in these forgings. X-ray at 2,000,000 volts did not prove adequate, since the defects were closed cracks not revealed by X-rays, when applied in the normal manner, and it was not practical to apply them in any other manner.

Ultrasonic inspection methods developed during the emergency period proved to be the answer and today this method is a universal tool, especially in the forge plant. The establishment of uniform methods, interpretation, and standards have been delaying factors, although definite progress is being made in that direction. It is expected that standardized methods will be reported in the near future.

Mr. Schaefer also discussed the subject of flakes, one of the "dread diseases" of forgings. The more accurate discovery of flakes has been made possible through ultrasonic inspection. The general characteristics were outlined and it appears that the nature of the causes is a subject of considerable controversy. Extensive experimental work and research have been conducted on this subject for the past few years and are now becoming indicative of causes. Results at the present indicate that the presence of hydrogen and transformation stresses are a prerequisite for flaking, with the greatest tendency found in the mixed structures.

Preventive treatment is based on the following procedure:

Removal of the forgings from the forge immediately and slow cooling under closely controlled conditions; allow time for complete transformation while the forgings are warm; reheating to above the transformation temperature for refinement of the structure; and control cooling and soaking at an intermediate temperature for transformation, followed by heating to a tempering temperature for hardness control, and stress relieving.

Further experimentation and research is in progress and it is expected that additional information as to causes and preventive treatments will be available in the future.—**Reported by F. J. Borgstedt for Des Moines Chapter.**

Dayton Panel Reviews Heat Treating

Panel Members Who Discussed "Heat Treat Problems" at a Meeting of the Dayton Chapter Were, Seated, From Left: Roger W. Edmonson, Lawrence L. Jaffe, and Stewart M. DePoy. Standing, from left, are: Harold Reindl, chairman, A. de S. Brasunas, coffee speaker, and S. R. Prance, moderator

The Past Chairmen's and Sustaining Members' Night meeting of the **Dayton Chapter** featured a panel discussion on "Heat Treat Problems". Members of the panel included Stewart M. DePoy, Dayton Forge and Heat Treat Co., Roger W. Edmonson, Metallurgical Service Inc., and Lawrence L. Jaffe, Frigidaire Division, General Motors Corp. Stanley R. Prance, Inland Manufacturing Division, General Motors Corp., served as moderator.

A series of five-minute talks on heat treating were given by the panel members preceding the discussion. The A.S.M. movie "Heat Treatment of Steel" was also shown.

In a discussion entitled "Why Heat Treat", Mr. Edmonson outlined the history of heat treating and listed the reasons for using the various types of operations. This was followed by a short talk by Mr. Jaffe on "Heat Treat Design" in which he stressed the do's and don'ts in heat treat design and the necessity for the proper selection of steel. Mr. DePoy discussed "Heat Treat Precautions" and stressed thorough study of a part before heat treating to insure the proper method being chosen, and the importance of knowing the properties of a part before actually heat treating. Mr. Prance summarized the panel's talks and stressed the importance of the relationship of steel microstructures to machinability. He stated that hardness tests can often be misleading when judging machinability.

Discussion on questions brought up by the audience included a comparison of salt bath heat treating and gas atmosphere controlled types, a comparison of vacuum melted steels to the present method with respect to hardenability, importance of stress relieving cast iron before machining and variations encountered in steel hardenability.

Anton de S. Brasunas from the A.S.M.'s headquarters staff, who was also a guest at the meeting, gave an interesting outline of the aims and functions of the Metals Engineering Institute and other general information concerning the national office. —**Reported by Walter J. Ridd for Dayton Chapter.**

● has produced and makes available for showing before chapters and educational institutions, moving picture films pertaining to metals.

Presents Textile Machinery Problems

Leaders at a Meeting Held by Worcester Chapter Included, From Left: Francis E. Kennedy, Kennedy Die Castings, Inc., Technical Chairman; Robert T. Hook, Warner & Swasey Co., Who Spoke on "Metallurgical and Engineering Problems in Textile Machinery Manufacture"; and Herbert D. Berry, Thomas Smith Co., Chapter Chairman. (Photograph by C. Weston Russell)

Speaker: R. T. Hook
Warner and Swasey Co.

Members of **Worcester Chapter** heard a talk by Robert T. Hook, chief metallurgist, Warner & Swasey Co., on the subject "Metallurgical and Engineering Problems in Textile Machinery Manufacture". Mr. Hook presented a series of slides illustrating specific machining and heat treating problems encountered in the development of textile machinery.

Each machine component is carefully studied for the best structural design and the raw material is carefully chosen as the best for a particular application. Shock resistant steels play an important part in the fabrication of this textile machinery.

Mr. Hook dwelt at length on the necessity of a finish free from marks which, when subsequently shot peened, gives the best results. A description of the test mechanism used at Warner & Swasey for duplicating years of every-day machinery runs in a short period of time, thus proving or disproving the design, choice of steel, heat treatment and ultimate finish of the component parts, was given.—**Reported by C. Weston Russell for Worcester.**

Recount Observations on European Metallurgy at Buffalo Chapter Meeting

Speakers: C. E. Jackson
Walter Crafts
George B. Michie

Western European nations have made a rapid recovery in metallurgical technology since World War II. With the assistance of the United States, these nations have advanced to a level well beyond pre-war years and, in some fields, have surpassed the United States.

Members of the **Buffalo Chapter** heard an unusually competent team of observers give their impressions of "Metallurgy in Europe" at a recent meeting. George B. Michie, vice-president of the Electro Refractories and Abrasives Corp., Clarence E. Jackson, group manager of welding, Metals Research Laboratories, Union Carbide and Carbon Corp., and Walter Crafts, A.S.M. trustee and associate director, Metals Research Laboratories, Union Carbide and Carbon Corp., reported on their recent trips to Europe.

Mr. Michie found that companies in England do not have the wide variety of products available to maintain plant operations that companies in this country are accustomed to. For instance, a department of one large refractory manufacturer is devoted exclusively to making electrical instruments for use within its own plants.

Industrial research organizations in Europe are similar to those in the United States, in that they are supported and guided by the policies of individual companies. The speakers were impressed by the competence, size and vigor of these research staffs and noted that they are engaged in research of a very high level. Metallurgical research is also carried out in a slightly different manner. Many laboratories are sponsored by trade institutes, which are made up of member companies manufacturing similar products. In France, a laboratory for research on the heat treating of steel is sponsored by a society of automobile and bicycle manufacturers and a foundry institute maintains a research laboratory which includes a complete foundry. The services of these laboratories are available to all members of the sponsoring societies. Mr. Crafts cited such developments as vacuum melting and casting, the low-shaft blast furnace and the Linz-Donowitz oxygen steelmaking process as examples of the research carried out in these organizations and attributed them, at least in part, to a greater degree of freedom in establishing research programs.

Mr. Jackson viewed welding operations and welding research facilities in almost all West European countries and England. He found that major differences between their practices and ours are dictated by economic conditions. Since labor is less expensive, there is much greater emphasis on the conservation of material. One German crane manufacturer could afford to make extensive strain gage tests of a new crane and translate the results into a material saving by lightening certain members in subsequent models to distribute loads more evenly. Although incidental to the main purpose, this also resulted in a crane which required less manpower to build.

Welding technology is highly advanced and developments in the United States are familiar to almost all European fabricators. Equipment and welding practices in general are modern. Differences are again dictated by lower labor costs rather than lower technological standards.

Mr. Jackson left Europe with the feeling that their shipyards and other fabricators of welded products had sufficient welding know-how to respond rapidly to any change in economic conditions.—**Reported by A. E. Leach for Buffalo.**

Golden Gate Educational Series on Metals in Use

The **Golden Gate Chapter** is sponsoring a series of four lectures, each of which will deal with the field of metals application of particular interest to local industry. The topic of the series will be "Application and Limitations of Metals in Service". The lectures, which will be given from 7:30 to 9:30 p.m. at Pacific Gas and Electric Co. will cover:

Apr. 4—Chemical and Petroleum, by John J. B. Rutherford, chief metallurgist, Tubular Products Division, Babcock and Wilcox Co.

Apr. 11—Aircraft, by R. H. Thielemann, manager, metallurgical section, Stanford Research Institute.

Apr. 18—Electronics, by L. W. Kates, engineering manager, Sylvania Electric Products Inc.

Apr. 25—Atomic Energy, by B. R. Elder, metallurgical specialist, Commonwealth Edison Project, General Electric Co.

In each field, emphasis will be placed on such aspects as the metals and alloys employed, why they are chosen for a given application, what their limitations are, examples of actual failure in service, reasons for such failures, and how such service problems are studied and solved.

Robert L. Ray, metallurgist, Pyromet Co., is chairman of the chapter's educational committee.

To Receive McFarland Award at Penn State

The Penn State Chapter has announced the selection of Van H. Leichliter as the 1956 recipient of the David Ford McFarland Award. Mr. Leichliter, vice-president, operations, American Steel & Wire Division, U. S. Steel Corp., will receive the Award at a dinner meeting on

V. H. Leichliter

Apr. 27 at State College, Pa. After the dinner he will deliver a technical address entitled "The Electomic Age —a Challenge to 125 Years of Wire Metallurgy".

Born in Mount Braddock, Pa., in 1906, he received his high-school education in Uniontown, Pa., and his metallurgical degree at Penn State.

Mr. Leichliter's career with American Steel & Wire began in 1930 when he was employed in the metallurgical laboratory at South Works, Worcester, Mass. He progressed through various departments and at different works of American Steel & Wire until 1953, when he was promoted to his present position, with headquarters at the Division's general offices in Cleveland.

He is vice-president of the American Standards Association as well as a member of A.I.S.I. and its committee on manufacturing problems. He belongs to numerous technical and social organizations.

Friends of Mr. Leichliter and the Penn State Chapter, and all A.S.M. members, are invited to make reservations for this dinner meeting with Prof. W. J. Reagan, Division of Metallurgy, College of Mineral Industries, Pennsylvania State University, University Park, Pa.

Details Current Problems Of High-Speed Flight At Baltimore Meeting

Speaker: J. F. Victory
NACA

J. F. Victory, executive secretary, National Advisory Committee for Aeronautics, spoke on "Some Problems of High-Speed Flight" at a meeting held in **Baltimore.**

During the 40 years in which Dr. Victory has been associated with the NACA, the speed of military airplanes has been increased from hardly 100 mph. to about 1000 mph.

Problems affecting the intercontinental ballistic missiles, which are expected to fly at speeds of 15,000 or more mph., were first considered. The true ballistic missile is accelerated to hypersonic speeds during the first 15 to 20 miles of its flight.

Among the many difficulties of hypersonic flight, the most troublesome at the present time appears to be aerodynamic heating resulting from skin friction. Temperatures high enough to melt, or even vaporize, most metals quickly develop in the air next to the skin of a hypersonic missile. Even at only half the speeds envisioned for the ICBM, or about 7000 mph., sustained flight would produce temperatures up to 8000° F. Very high rates of heat transfer exist at such elevated temperatures. This, of course, means that heat will flow rapidly into the aircraft's skin and structure.

Despite the magnitude of the temperatures to be dealt with, a number of promising techniques are under intensive investigation as possible solutions to the problem. One of these, transpiration cooling, requires use of a porous skin through which a liquid may be evaporated. Other ways suggested to preserve the structure from disintegrating have included the use of high-melting-point ceramic and metallic materials, and insulation.

Dr. Victory next considered the problems affecting military airplanes of tomorrow. In December 1953, Yeager flew the Bell X-1A to a speed of approximately 2½ times the speed of sound, or 1650 mph., at the altitude and temperature at which the flight was made. Today, another of the research airplanes, the Bell X-2, is beginning another chapter of the cooperative attack on the problems presented when still higher speeds are reached. Not much has been released about this airplane, except that it is constructed of stainless steel—obviously because of the higher temperatures expected from aerodynamic heating—and because it may be expected to attain speeds of the order of 2000 mph.

Commercial air transport has lagged behind military aircraft speed. By 1959, it is expected that American-built jet airliners will be cruising at speeds of 550 mph. or more. Ralph Damon, who heads TWA, predicted that we may expect airliners will be flying at 1000 mph. speeds by 1975.

Perhaps the most difficult task is in fitting men to the high-performance machines we hope to build. If man had to do it all by himself, he'd never get into the air. He has been able to harness the power of machines, and to protect himself against the elements by other machinery, until today he is able to rise to heights where, without such protection, his blood would boil and he would die in a matter of seconds.

Dr. Victory closed with the thought that future flying speeds may make it possible for a man to have one breakfast in New York and a second one in Los Angeles on the same morning.—**Reported by John S. White for Baltimore Chapter.**

Los Angeles Tours General Motors

Members of the Los Angeles Chapter Toured the Assembly Plant of the General Motors Corp., in Los Angeles During a Recently Held Meeting. A group of 167 were present, including, above, from left: Charles H. Dickson; Harvey Anderson, plant production superintendent; Edward W. Golda, chairman, plant visits committee; Jerry Stumpf, plant superintendent of maintenance; and William V. Ward, chairman of the educational committee

Program for the Southern Metals Conference

The Annual Southern Metals Conference of the southern chapters A.S.M. will be held from May 7 through May 9, 1956, in Winston-Salem, N. C. The technical sessions will be held daily from 1:00 p.m. until 4:00 p.m. and will consist of the following papers contributed through the different chapters participating in the Conference:

Oak Ridge—Material Problems in Nuclear Reactors, by W. D. Manly; Nondestructive Inspection of Materials for Nuclear Reactors, by R. B. Oliver.

Old South—Replacement of Castings by Powder Metallurgy, by T. L. Robinson; Carburizing Highly Stressed Parts, by H. T. Davis and Michell Allen.

Birmingham—Boron Steels, by J. R. Kattus; European Melting and Foundry Practice, by C. K. Donoho.

Jacksonville—Introduction to Titanium, by Bernard Boisvert; Nitriding Stainless Steel, by William T. Tiffin.

New Orleans—Use of Radio-Isotopes for Radiographic Inspection, by James S. Shilstone; Predictable Behavior of Welded Structures, by Thomas J. Dawson.

Atlanta—Electric Furnaces Versus Openhearth Furnaces, by J. E. Wilbanks.

These papers are aimed at the practical man with a view of giving immediate benefit in knowledge for application to everyday problems.

Registration for the sessions will open Sunday, May 6, from noon until 6:00 p.m. Registration for the other days will open at 8:00 a.m. and continue until 5:00 p.m.

National President A. O. Schaefer and Secretary W. H. Eisenman will conduct the Chapter Officers Breakfast and Orientation Meeting. All chapter officers and incoming officers are invited and urged to attend this meeting.

The Conference Representatives' Breakfast will be held on Tuesday, May 8, from 7:30 to 9:30 a.m. The Old South Chapter's petition for membership will be presented at this time.

A plant tour of the R. J. Reynolds Tobacco Co. will be available from 9:30 to 11:30 a.m. on May 8, and the Annual Banquet and Dance will be held from 7:00 p.m. until midnight. The banquet speaker will be President Schaefer.

On May 9, the Chairman's Breakfast will be held from 7:30 to 9:30 a.m. A plant tour of the Western Electric Co. will be taken from 9:30 to 11:30 a.m. Proof of citizenship will be required for this tour.

Ladies activities are being planned for the three days of the sessions and the ladies have been invited to take the tour of the tobacco company if they wish.

The Conference will close after the technical sessions end at 4:00 p.m. on Wednesday, May 9.

Salt Baths Topic at Lehigh Valley

Shown at the 25-Year Members Night Meeting Held by Lehigh Valley Are, From Left: A. F. Holden, President, A. F. Holden Co., Who Spoke on "Salt Bath Heat Treating"; J. C. DeBlasse, Reading Commercial Heat Treating Co., Technical Chairman; L. H. Hopkins, American Chain & Cable Co. a 25-Year Member; J. F. Clark, Secretary; and M. C. Moffett, Moffett Manufacturing Co., a 25-Year Member. A student scholarship was awarded the same night to Collmar Seastrom, a metallurgy freshman at Lafayette

Speaker: A. F. Holden

A. F. Holden Co.

A. F. Holden, president, A. F. Holden Co., discussed "Salt Bath Heat Treating" at the 25-Year Members Night meeting of the **Lehigh Valley Chapter.** He covered the principles of construction and operation of salt bath heat treating equipment.

Mr. Holden reviewed the advantages of salt bath heating as compared to electric and fuel-fired furnaces. Although the initial cost of salt bath equipment is higher, it heats more rapidly and without scaling with consequent metal loss and dimensional change. It is therefore suited to heat treatment after final machining.

Mr. Holden stated that by proper selection of salt bath composition for the grade of steel and temperature involved, carbon content can be closely controlled. Because of the more rapid heating, less furnace space is required. Features of furnace design and construction to control circulation of molten salt and to produce uniform temperatures were illustrated with lantern slides.—**Reported by R. H. Holloway for Lehigh Valley Chapter.**

German Institute Invites ASM Members to Meeting

The Institut fuer Haerterei-Technik, Bremen, Germany, is planning its Third International Meeting on Heat Treating, to be held on Friday, July 6, 1956, at the Schweinfurth facilities of S.K.F. The discussion will be preceded by visits to the S.K.F. plant, and optionally to the Fichtel u. Sachs AG. plant. The subject of the meeting will be "Mechanization in the Heat Treating Department".

The officers of the Institut have extended invitations to A.S.M. members to join them in this meeting. Should the visitor wish to visit plants while in Germany, the Institut will make necessary arrangements. Notice of intended participation should be sent to: Institut fuer Haerterei-Technik, Bremen-St. Magnus, Postfach 13, Germany.

Castings Series in Akron

Akron Chapter has announced its seventh annual educational program, this year to feature "Principles of Ferrous Casting". E. E. Thompson, superintendent, pattern department, Unitcast Corp., will open the series on Mar. 28 with a talk on "Pattern Design"; R. L. Gathmann, metallurgist, Babcock & Wilcox Co., will discuss "Molding and Coremaking" on Apr. 4; C. F. Bunting, metallurgist, Rockwell Manufacturing Co., will cover "Melting and Pouring" on Apr. 11; Joseph Pinter, iron and steel casting inspector, Babcock & Wilcox Co., will speak on "Cleaning and Finishing" on Apr. 18; R. W. Dively, castings coordinator, Goodyear Aircraft Corp., will describe "Techniques of Precision Castings", on Apr. 25; and L. W. Hudson, chief metallurgist, Goodyear Aircraft Corp., will discuss "Properties of Ferrous Castings" on May 2.

Meetings will be held at the University of Akron, Simmons Hall, Room 155, from 7:30 to 9:00 p.m. A copy of the Steel Castings Handbook, published by the Steel Founders Society of America, will be given to each registrant.

Members of the educational committee for this program include: M. Goldman, Goodyear Aircraft Corp., chairman; and Gilbert Reymann, C. F. Bunting, Wayne Alley, R. P. Shimkus, F. R. Lisic, A. R. Nasrallah and L. W. Hudson.

A.S.M. Review of Current Metal Literature

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad Received During the Past Month

Prepared by the Technical Information Division of Battelle Memorial Institute, Columbus, Ohio

A General Metallurgical

53-A. Metalworking Roundup. *Iron Age,* v. 177, Jan. 5, 1956, p. 160-178.

Progress in 1955 and forecast of future developments in machining, joining, casting, stamping and forming, testing, materials handling, metallurgy, metal finishing, heat treating. Photographs. 21 ref. (A general)

54-A. Price and Production Data 1956. *Iron Age,* v. 177, Jan. 5, 1956, p. 285-300.

Statistics and trends for 1956 in steel, nonferrous metal powders, ferro-alloys, pig iron, iron ore, scrap. Tables, graphs. (A4)

55-A. Engineering Features of Uranium Plant Design. II. S. Craib. *South African Mining and Engineering Journal,* v. 66, pt. 2, Dec. 3, 1955, p. 511 + 4 pages.

Some of the major items of equipment used in a uranium plant in South Africa and an estimated capital cost for the plant and ancillary equipment. Diagrams, photographs. (A5, B14, U)

56-A. Scheduling and Inventory Control of Cold Drawn Orders. T. W. Harman and J. C. Farrell. *Wire and Wire Products,* v. 31, Jan. 1956, p. 46-48.

A step by step description of an accurate and flexible scheduling job. (A5, F28)

57-A. Production Scheduling and Inventory Control. John L. Sanderson. *Wire and Wire Products,* v. 31, Jan. 1956, p. 48-49.

Summarization of handling of inventory control problems. (A5, F28)

58-A. (English.) **Rail Transport of Hot Ingots.** *Aciers fins & spéciaux francais,* no. 21, Nov. 1955, p. 17-19.

Novel process may improve operations in French steel industry. Photographs, diagram. (A5, ST)

59-A. (English.) **The European Coal and Steel Community.** D. P. Spierenburg. *Jernkontorets Annaler,* v. 139, no. 11, 1955, p. 863-884.

General account of the European coal and steel community and its activities. Development of a common market and solving incident social problems. (A4, ST)

60-A. (Spanish.) **Toxic Gases and Vapors in Welding.** J. Dantin Gallego. *Ciencia y técnica de la soldadura,* v. 5, no. 26, Sept.-Oct. 1955, 4 p.

Different gases to which the welder may be exposed and the effect of different concentrations on the body. Tables, diagram. 23 ref. (A7, K general)

61-A. Steel Industry Provides Record Tonnage of Steel in 1955 and Steps Up Plans for Expansion. Max D. Howell. *Blast Furnace and Steel Plant,* v. 44, Jan. 1956, p. 41.

Condensed review of statistics relating production, employment, wages and equipment. (A4, ST)

62-A. Consumption of Purchased Scrap in 1955 at a New Peak. Edwin C. Barringer. *Blast Furnace and Steel Plant,* v. 44, Jan. 1956, p. 42-43.

Statistics on domestic consumption and figures on the amount and costs of scrap exported to all countries. Photographs. (A4, A8, Fe, ST)

63-A. Westinghouse Operates Metal Processing Plant. Warren Trigg. *Blast Furnace and Steel Plant,* v. 44, Jan. 1956, p. 51-54.

Plant satisfies demand for raw metals to keep pace with technical developments in the electrical industry. Photographs, diagram. (A5, T1)

64-A. Feeding Chemicals to Boilers in Steel Mill Power Plants. Douglas E. Noll. *Blast Furnace and Steel Plant,* v. 44, Jan. 1956, p. 82-86.

Method and rate of phosphate feeding, pumps and eductors. Graphs, diagram, flowsheet. (A5)

65-A. Metal Losses and Balances in the Brass Foundry. Harry St. John. *Foundry,* v. 84, Jan. 1956, p. 84-87.

Foundry profit depends upon maintaining a high proportion of good finished castings to a minimum net metal loss. Photograph, tables. (A5, A8, E general, Cu)

66-A. Modern Reclamation of Non-Ferrous Metals. S. W. Platt. *Metal Industry,* v. 87, Dec. 30, 1955, p. 549-553.

Economical sorting and grading of high-tensile brass and manganese bronze, alloy grades in borings and turnings, scrap electric cables. Photographs. (A8, Cu, Mn)

67-A. Training of Technical and Scientific Manpower in the U.S.S.R. N. H. Polakowski. *Metal Progress,* v. 69, Jan. 1956, p. 68-72.

Methods employed and results achieved by Russia in training engineers and scientists. Diagram, photographs. (A3)

The coding symbols at the end of the abstracts refer to the ASM-SLA Metallurgical Literature Classification. For details write to the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

68-A. Metallurgical Research in India. R. F. Bunshah. *Metal Progress,* v. 69, Jan. 1956, p. 88-90.

Work being done in four governmental, four universities and one industrial laboratory, from which several new manufacturing processes have been derived. (A9)

69-A. Metalworking in Colombia, South America. Gerald X. Diamond. *Metal Progress,* v. 69, Jan. 1956, p. 97-101.

Colombia's metal industries, methods being used, technical assistance, mining operations, future possibilities. Map, photographs. (A general)

70-A. Safety: It's No Accident. Charles H. Elsby. *Modern Castings,* v. 29, Jan. 1956, p. 38-39.

Long-range safety program in operation reduces accident frequency 78% below the national foundry average. Photographs. (A7)

71-A. Recovery of Iodine From Cerium Slag. J. E. Powell, Clifford Hach and R. W. Nottorf. *U. S. Atomic Energy Commission,* TID-5212, Sept. 1955, p. 41-42.

Investigation of wet and dry methods of iodine recovery. Diagram, 1 ref. (A8, B21, C26, I, Ce)

72-A. Production Standards and Their Place in the Foundry Industry. Stuart D. Martin. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 317-324.

Cost estimating based on production standards and the value of standards in foundry operations. Photographs. (A5, E general)

73-A. Your Hidden Fixed Costs and Their Effect on Profit and Loss. M. E. Annich. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 363-366.

How hidden fixed costs affect profit and loss in the foundry. Graphs, tables. (A4, E general)

74-A. Improving Foundry Paperwork. M. E. Mundel. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 413-418; disc., p. 418.

Evaluates "communications" in respect to paperwork in the foundry and shows the significance of assignment of clerical tasks, flow of forms, and formates. Photographs, flow charts. (A5, E general)

75-A. The Safe Handling of Radioactive-Pyrophoric Materials. L. R. Kelman, W. D. Wilkinson, A. B. Shuck and R. C. Goertz. *Argonne National Laboratory (U. S. Atomic Energy Commission),* ANL-5509, Dec. 1955, 73 p.

Methods of safely handling large amounts of high-intensity alpha emitters. Health hazards and methods of protecting personnel. Diagrams, photographs, tables. 32 ref. (A7)

76-A. Dust Generation and Control in Foundries. W. H. White. *Iron &*

Steel, v. 29, Jan. 1956, p. 3-7.

Dust sampling and estimation procedures. Ventilation of areas used for pouring, cooling, knocking out and cleaning castings. Photographs, diagrams. (A8, E general)

77-A. Steel Management on Two Continents. Frederick H. Harbison, Ernst Kochling, Frank H. Cassell and Heinrich C. Ruebmann. *Management Science*, v. 2, Oct. 1955, p. 31-39.

Comparison of the numbers of persons in various levels of management or supervision and the nature of the educational background of those holding managerial positions; trends in managerial organization and in access to supervisory and managerial positions. Tables. (A6, A3)

77-A. Explosions Occurring During Chemical Etching or Pickling of Uranium-Zirconium Alloys. H. P. Roth. *Massachusetts Institute of Technology (U. S. Atomic Energy Commission)*, MIT-1105, Dec. 1952, 16 p.

Factors responsible for five minor explosions occurring in various departments of the laboratory. Alloys of greater than 75 wt.% uranium should not be placed in nitric acid. (A7, L12, U, Zr)

78-A. Linear Programming. . .An Application to Swarf Recovery. II. E. Kay and G. Morton. *Metalworking Production*, v. 99, Dec. 30, 1955, p. 2215-2219.

Economical mixing of materials. The Simplex method may be used to solve any programming problem. Graphs, tables. (A8)

79-A. Nickel Story. *Plating*, v. 43, Jan. 1956, p. 91-106.

A series of statements, on the effect of the nickel shortage, contributed by members of the National Association of Metal Finishers, the American Electroplaters' Society, and other private organizations. Graphs, tables. (A4, Ni)

80-A. More Work for Water. *Steel*, v. 138, Jan. 30, 1956, p. 84-86.

Industry is helping itself as well as the other fellow when it conserves and recirculates water. Photographs, graph. (A5)

81-A. Recent Trends in Plant Layout. Andrew E. Rylander. *Western Machinery and Steel World*, v. 47, Jan. 1956, p. 79-84.

Basic principles of plant layout, automation and use of flat and three-dimensional layout. Photographs, diagrams. (A5)

82-A. (Spanish.) **Fundamentals and Development of Technical Apparatus for the Treatment of Solid and Liquid Metallic Materials With Intensive Mechanical Vibrations, With Special Consideration to the Electrodynamic Process.** Hugo J. Seeman. *Instituto del hierro y del acero*, v. 8, no. 39, Oct. 1955, p. 459-474.

Different apparatus for generating and transmitting ultrasonic waves. Electrodynamic methods of generating vibrations in a material under treatment. Graphs, diagrams. (A general, S13)

83-A. (Book.) **Hawley's Technical Speller.** Gessner G. Hawley and Alice W. Hawley. 146 p. 1955. Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. $2.95.

Indicates correct spelling of 8000 technical words selected from the vocabularies of metallurgy, chemistry, physics, engineering, electronics, and other fields of science and technology. (A10)

84-A. (Book.) **Index to the Year Books and Regional Papers of the American Iron and Steel Institute 1910-1953.** Jeanne McHugh, compiler. 593 p. 1955. University of Oklahoma Press, Norman, Okla. $12.50.

A combined subject and author index to the Year Books of the Institute. (A general, Fe, ST)

85-A. (Book.) **Symposium on Electronics and Automatic Production, Proceedings.** 171 p. 1955. National Industrial Conference Board, Inc., 247 Park Ave., New York 17, N. Y. and Stanford Research Institute, Menlo Park, Calif.

Problems which arise and the opportunities offered by automation in various businesses and industries. Economic and social implications of automation. (A5)

86-A. (Book.) **Vacuum Metallurgy.** 213 p. 1955. Electrochemical Society, Inc., 216 West 102nd St., New York 25, N. Y.

Contains nineteen papers presented at the Vacuum Metallurgy Symposium of the Electrothermics and Metallurgy Division of the Electrochemical Society in Boston in Oct. 1954. Furnaces, techniques, and applications are covered. (A general)

B

Raw Materials and Ore Preparation

33-B. The Pelletizing Plant at Malmbreget, Sweden. *Mining Journal*, v. 245, Dec. 16, 1955, p. 708-709.

Description of full-scale pilot plant with a capacity of approximately 20 tons of magnetite concentrates an hour. Diagrams. (B16, Fe)

34-B. Sintering Plant for Sheffield Steel. *Steel*, v. 138, Jan. 16, 1956, p. 76, 79.

Layout of a plant and ore bedding system in which the savings in coke alone should pay sintering costs. Diagram, photographs. (B16, AY)

35-B. (English.) **On the Sedimentation of Red Muds in the Bayer Process.** E. Papp, I. Magyarosy and A. Héjja. *Acta Technica Academiae Scientiarum Hungaricae*, v. 13, nos. 1-2, 1955, p. 33-52.

Electrophoretic and other studies of methods to accelerate the settling-out of the insoluble residue of the treatment of bauxite with caustic soda solution. Tables, diagrams, micrographs, graphs, photograph. 17 ref. (B14, Al)

36-B. (French.) **Dolomite Bricks in the Steel Industry.** Marcel Guédras. *Métallurgie et la construction mécanique*, v. 87, no. 11, Nov. 1955, p. 871-873.

Process of manufacturing bricks from dolomite and serpentine by fusion and application of high pressure. (B19)

37-B. (French.) **Comparative Study of Some Properties Relative to Slags and Ashes.** Albert Nicol and Marthe Domine-Berges. *Silicates industriels*, v. 20, no. 11, Nov. 1955, p. 410-418.

Action of water, electrolysis, action of pressure and temperature on slag powder. Tables, graphs, diagrams. 3 ref. (B21)

38-B. (Finnish.) **Otanmäki Vanadium Plant.** Martti Merenmies. *Teknillisen kemian aikakausilehti*, v. 12, no. 19, Nov. 30, 1955, p. 648-650.

New method for vanadium separation of magnetite and ilmenite concentrates. Photographs. (B14, Fe, Ti, V)

39-B. (French.) **Characterization of Tars for Dolomite Linings. Role of Phenols, Naphtalenes, and Insolubles.** J. Massinon. *Centre de documentation sidérurgique, circulaire d'informations techniques*, v. 12, no. 11, 1955, p. 2063-2069.

Using synthetic tars, with varying amounts of phenols, naphthalenes and insolubles, an attempt is made to determine their influence on the cohesion of dolomite refractories. Tables, graphs. (B19, ST)

40-B. (Japanese.) **Studies on the Utilization of Pyrrhotite Ores. I. On the Leaching Process.** Katsuyuki Hikami, Renpei Sei, Fumio Isomura, Katsuji Higuchi, Michio Ichijo, Hiroto Yonezawa, Tatsugoro Iwata and Tadashi Fujinuki. *Resources Research Institute, Report (Japan)*, 1955, no. 32, Dec., 32 p.

Research on the wet treatment of pyrrhotite ores. Describes operation of a pilot plant having a 1.5 ton per month capacity. Graphs, tables, diagrams, photographs. (B14, Fe)

C

Nonferrous Extraction and Refining

40-C. Amine Extraction Processes for Uranium Recovery From Sulfate Liquors. D. J. Crouse and K. B. Brown. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-1959, v. 1, Sept. 1955, 79 p.

Bench scale studies were made of processes for recovery of uranium from ore leach liquors by solvent extracting with long chain amines in an organic diluent. Several process schemes have been evaluated which show considerable promise both from the standpoint of operation and chemical costs. Diagrams, tables, graphs. 10 ref. (C28, U, Th, V, Fe, Be)

41-C. (German.) **Fusion Electrolysis of Lithium Chloride.** G. Parissakis and W. D. Treadwell. *Helvetica Chimica Acta*, v. 38, no. 7, 1955, p. 1749-1756.

Solid reactions of transformation for lithium carbonate and phosphate into lithium chloride or bromide. Calculation of potassium solubility in lithium at 405° C. (C23, Li)

42-C. (Italian.) **Purity of Metals.** Giuseppe Pani. *Fonderia*, v. 4, no. 10, Oct. 1955, p. 465-469.

Production methods, characteristic properties, fields of application. Tables, diagrams, graphs. 3 ref. (C general, Al, Mg)

43-C. Feed Materials Production—New Opportunity for Uranium Men. Wilbur E. Kelley. *Engineering and Mining Journal*, v. 157, Jan. 1956, p. 78-84.

Developments in production of feed materials and influence it may have on private industry in uranium processing. Diagrams, photograph, table. (C general, U)

44-C. Solubility Data for Aluminum Reduction Systems. Jack L. Henry and W. M. Lafky. *Industrial and Engineering Chemistry*, v. 48, Jan. 1956, p. 126-128.

Periodical feeding of alumina, as concentration is depleted, improves solubility values. Survey to show effect of salt additives on solubility of alumina in molten cryolite. Table, diagram, graph. 6 ref. (C23, Al)

45-C. Electromagnetic Suspension of a Molten Zone. W. G. Pfann and D. W. Hagelbarger. *Journal of Applied Physics*, v. 27, Jan. 1956, p. 12-18.

New method of container-free zone melting, based on electromagnetic

suspension, avoids certain limitations of existing methods. Diagrams, graphs, photograph. 11 ref. (C5)

46-C. Metals of High Purity. J. C. Chaston. *Metal Progress,* v. 69, Jan. 1956, p. 64-67.

Five chemical and six thermal methods for driving solid and gaseous impurities down to low amounts; purity of the various metals refined by these methods tabulated. Tables. (C general)

47-C. Electrodeposition of Some of the Less Common Metals From Nonaqueous Media. Abner Brenner. *Record of Chemical Progress,* v. 16, no. 4, 1955, p. 241-269.

Production of metals by electrolysis, procedures and chemistry involved in electrodeposition of metals from fused salts and electrodeposition of nonaqueous metal from organic baths. Diagrams, graphs, micrograph, photographs, tables. 50 ref. (C23, L17)

48-C. Magnesium From Olivine Via Chlorination: A Possibility. Kermit B. Bengtson. *Trend in Engineering (University of Washington),* v. 8, Jan. 1956, p. 21-26, 35-36.

Chemical properties of olivine and mechanism of chlorination reactions. Diagrams, micrographs, graph, table. 17 ref. (C4, Mg)

49-C. The Preparation of Cerium by Electrolysis of Molten Salts. E. D. Eastman, B. J. Fontana, C. D. Thurmond and W. K. Wilmarth. *U. S. Atomic Energy Commission,* TID-5212, Sept. 1955, p. 14-24.

Development of method for preparing single ingots of pure cerium in amounts up to 100 g. with high net efficiency. Electrolysis was performed in the $CeCl_3$-CaF_2-LiF and $CeCl_3$-KCl-LiCl systems. Tables. 10 ref. (C23, Ce)

50-C. Preparation of Cerium by Chemical Reduction in Open Crucibles in an Inert Atmosphere. E. D. Eastman, W. D. Gwinn, and D. D. Cubicciotti. *U. S. Atomic Energy Commission,* TID-5212, Sept. 1955, p. 25-31.

With pure cerium chloride, a 99% yield of metallic cerium was obtained. Diagram, tables. 2 ref. (C26, Ce)

51-C. The Production of Cerium in the Massive Metallic State. W. H. Keller, Robert P. Ericson and Clifford Hach. *U. S. Atomic Energy Commission,* TID-5112, Sept. 1955, p. 32-36.

Procedure for bomb reduction of cerous chloride with magnesium or calcium to produce 90% yields of metallic cerium. Boosters of dry iodine or iodine and potassium perchlorate were used. Lanthanum was similarly produced. Diagrams, table. 10 ref. (C26, Ce, La)

52-C. The Casting of Cerium and Some Properties of the Cast Metal. David Peterson, Ward Lyon and W. H. Keller. *U. S. Atomic Energy Commission,* TID-5212, Sept. 1955, p. 37-40.

Casting of metallic cerium produced in a vacuum by reduction of anhydrous cerium chloride, with calcium, using iodine as a booster. Properties, working, fabrication. Diagram. 6 ref. (C25, C5, Ce)

53-C. The Production of Beryllium by the Metallothermic Reduction of Beryllium Fluoride. F. H. Spedding, H. A. Wilhelm, W. H. Keller and Charles Neher. *U. S. Atomic Energy Commission,* TID-5212, Sept. 1955, p. 43-48.

Both closed bomb and open reaction chamber methods investigated. Clean massive metal best produced by reaction of beryllium fluoride and magnesium in graphite crucibles, with a calcium chloride booster. 11 ref. (C26, Be)

54-C. Production of Beryllium Metal Ingots for Extrusion. C. B. Sawyer and C. H. Tower. *U. S. Atomic Energy Commission,* TID-5212, Sept. 1955, p. 67-73.

Method for production of sound, high-density ingots for extrusion and machining. Vacuum cast metal was superior in quality to centrifugally cast, but both were superior to air cast. Diagram, photographs. 1 ref. (C5, Be)

55-C. Keynote Address. The Bright Spark in the Metals Industry. James D. Nisbet. Paper from "Vacuum Metallurgy". Electrochemical Society, Inc., p. 1-11.

History and development of vacuum melting of metals. Photographs, diagrams, graph. (C25, D8)

56-C. Arc Melting in High Vacuum. P. C. Rossin. Paper from "Vacuum Metallurgy". Electrochemical Society, Inc., p. 12-23.

Factors associated with arc stability and control and their influence on the melting practice. Presents a qualitative analysis of the thermal equilibrium associated with the cathode, arc column, anode and mold-metal interface. Micrographs, diagrams, graph. 3 ref. (C25)

57-C. Vacuum Melting of High-Alloy Materials. H. R. Spendelow, Jr., I. S. Servi and G. A. Fritzlen. Paper from "Vacuum Metallurgy". Electrochemical Society, Inc., p. 24-34.

Investigation of reactions during vacuum melting and its effect on mechanical properties of Hastelloy Alloy R-235. Advantages of process. Tables, graphs, micrographs. 3 ref. (C25, Ni)

58-C. The Design and Operation of an Induction and a Resistance Furnace for High-Vacuum, High-Temperature Applications. R. F. Domagala and D. J. McPherson. Paper from "Vacuum Metallurgy". Electrochemical Society, Inc., p. 67-71.

Two improved furnaces designed for alloy melting-point determinations and isothermal heat treatments at temperatures from 1500 to 2500° C. under high-vacuum conditions. Portable vacuum unit designed to continuously evacuate the furnaces described. Diagrams. 2 ref. (C25, C21, J general)

59-C. The Economics of Vacuum Melting. G. Jewett Crites. Paper from "Vacuum Metallurgy". Electrochemical Society, Inc., p. 97-99.

Comparison made with melting in atmospheric induction furnace. Higher costs of melting in a vacuum furnace, which result from the increasing number of operations required, cost of vacuum equipment and of power used by the vacuum pumps, may be offset by increased yields due to absence of slag and maintenance of chemical composition. Table. (C25)

60-C. Deoxidation of Vacuum-Melted M 252. W. F. Moore and R. K. McKechnie. Paper from "Vacuum Metallurgy". Electrochemical Society, Inc., p. 100-105.

Use of various deoxidizers and methods of carrying out deoxidizing reactions. Oxygen and nitrogen contents resulting from these processes determined. As an aid in interpreting results, upset tests were carried out on top and bottom portions of the experimental ingots. Diagrams, tables, micrographs. (C25, Ni, Cr)

61-C. Hydrogen Deoxidation of Vacuum-Melted High-Temperature Alloys. R. L. Hadley and L. M. Bianchi. Paper from "Vacuum Metallurgy". Electrochemical Society, Inc., p. 106-121.

Equipment and method by which an impinging stream of dry hydrogen on a molten metal surface reduces the oxygen content of iron, nickel and cobalt to below 0.005% at 1570° C. Deoxidation process is relatively insensitive to pressure, flow rate, time after approximately 10 min. and atomization of hydrogen. Table, graphs, diagrams, photographs. 7 ref. (C25, Fe, Ni, Cr, Co)

62-C. The Application of Vacuum Technology to Metallurgical Processes. Robert G. Ulrech. Paper from "Vacuum Metallurgy". Electrochemical Society, Inc., p. 122-127.

Application of vacuum techniques to annealing, sintering, soldering, brazing, outgassing, purification, refining, distillation, melting and casting. Describes 1000-lb. melting and casting unit designed for semi-continuous operation. Diagrams, photograph. (C25, J general, K7, K8)

63-C. Solid-State Purification of Molybdenum by Induction Heating. F. C. Todd, J. E. Drennan and W. W. Kleinschmidt. Paper from "Vacuum Metallurgy". Electrochemical Society, Inc., p. 142-146.

Use of "degassed" electrodes for VR-tubes reduces conditioning time. The molybdenum electrodes may be degassed by this technique which heats the electrodes for a minimum of 6 hr. at 190° C. and at a pressure of 5×10^{-5} mm. of mercury or less. Micrographs, graph, diagram. 5 ref. (C25, Mo)

64-C. Vacuum Degassing of Titanium. C. B. Griffith and M. W. Mallett. Paper from "Vacuum Metallurgy". Electrochemical Society, Inc., p. 147-154.

Considering the rapidity of degassing and minimum residual hydrogen content for a given pressure, the optimum degassing temperature for RC-55 titanium was 815° C. At lower temperatures, the rate is slower and solubility limit higher. Time required to degas titanium varies roughly as the square of the specimen diameter. Tables, diagram, graphs, photograph. 4 ref. (C25, Ti)

65-C. Experiments on Vacuum Distillation of Nonferrous Metals and Alloys. Max J. Spendlove. Paper from "Vacuum Metallurgy". Electrochemical Society, Inc., p. 192-213.

Mechanism of evaporation, experiments on vacuum distillation of zinc, vacuum distillation of vocatile methods from lead and tin. Principal drawbacks are: operations must be on a batch basis; transfer of heat into a vacuum system on a practical scale is difficult; selection of construction materials is limited. Diagrams, tables, graphs, photographs. 11 ref. (C25, C22, Zn, Pb, Sn, Mg, Cd, Te)

66-C. (German.) Manufacture, Properties, and Applications of High-Purity Aluminum. *VDI Zeitschrift,* v. 97, no. 35, Dec. 11, 1955, p. 1281-1283.

Method of electrorefining 99.99+% pure aluminum for coating and plating purposes as an anticorrosive material. Tables, graph, diagram. 4 ref. (C23, L17, Al)

67-C. (Russian.) Mechanism of Reduction of Magnesium Oxide by Carbon. B. S. Gulianitskii and D. M. Chizhikov. *Izvestiia akademii nauk SSSR, otdelenie tekhnicheskikh nauk,* 1955, no. 11, Nov., p. 13-24.

Relation of reduction rate to pressure of carbon monoxide; volatility of magnesium oxide in vacuum and in argon atmosphere; effect of temperature on reaction speed in CO and in vacuum. Graphs. 30 ref. (C general, Mg)

68-C. Electrodeposition of Beryllium, Thorium and Zirconium From Fused-Salt Baths. J. A. Gurklis, J. G. Beach and C. L. Faust. *Battelle Memorial Institute (U. S. Atomic Energy Commission),* BMI-781, Nov. 1952, 20 p.

Flakes of beryllium were produced by electrolysis of $BeCl_2$ + KCl-LiCl baths, and purity compares favorably with that of vacuum distilled; dendritic thorium and zirconium were produced by electrolysis of $ThCl_4$ + KCl-LiCl baths and ZrF_4 + KCl-LiCl baths, respectively. Powdered zirconium was obtained from $ZrCl_4$ + KCl-LiCl bath. Tables, photographs. (C23, Be, Th, Zr)

69-C. The Melting of Small Pieces of Uranium Metal. W. R. DeHollander. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission)*, HW-38912, Sept. 1955, 8 p.

Small pieces, such as turnings, are melted in a magnesium oxide crucible in the presence of barium chloride and metallic calcium and in an inert atmosphere of argon. Method is appropriate for recovery and consolidation of metal with a high accountability value, such as uranium isotope 235. (C21, U)

70-C. Why Is the Big Money Behind Vacuum Metals? P. M. Unterweiser. *Iron Age*, v. 177, Jan. 26, 1950, p. 67-72.

Up-to-date information on and an evaluation of vacuum metallurgy. List of firms actively engaged in the process. Photographs. (C25, D8)

71-C. The Extraction of Zirconium (IV) By Tributyl Phosphate. E. W. Murbach and W. H. McVey. *Livermore Research Laboratory (U. S. Atomic Energy Commission)*, LRL-115, Apr. 1954, 14 p.

The distribution of zirconium 95 tracer between 30% tributyl phosphate in carbon tetrachloride and varying concentrations of nitric acid were measured and the extraction equilibria of zirconium in tributyl phosphate solution studied. The equilibrium constant for the formation of the complex is 5×10^{-3}. Graphs, tables. 6 ref. (C general, Zr)

72-C. A Metallurgical Evaluation of Refractory Compounds for Containing Molten Titanium. I. Oxides. II. Carbon, Graphite, and Carbides. III. Borides and Sulfides. E. J. Chapin and W. H. Friske. *Naval Research Laboratory, NRL Report* 4447, Nov. 1954, 39 p.; 4467, Dec. 1954, 22 p.; 4478, Jan. 1955, 31 p.

All oxides investigated were attacked in varying degrees of severity by molten titanium. The carbides tested are not suitable crucible materials and the diborides of titanium, zirconium and chromium are not promising. Further investigation is necessary on CeS. Graphs, photographs, tables. 66 ref. (C21, Ti)

73-C. An Investigation of the Hydrogen Glow Discharge as a Means of Reducing Metal Halides. C. I. Whitman and R. B. Holden. *Sylvania Electric Products Incorporated (U. S. Atomic Energy Commission)*, SEP-123, Sept. 1953, 28 p.

Reactions and operating procedures. Possibility of recycling unreacted material. Diagrams, photographs, table. (C4, Be, Th, U, Zr)

74-C. (English.) **The Preparation and Properties of Pure Metals.** J. C. Chaston. *Schweizer Archiv für angewandte Wissenschaft und Technik*, v. 21, no. 12, Dec. 1955, p. 411-414.

Survey of methods of purification. Effects of impurities on properties. Tables. (C general)

75-C. (German.) **Titanium Sponge: Melting Methods and Properties.** Ulrich Zwicker. *Zeitschrift für Metallkunde*, v. 46, no. 12, Dec. 1955, p. 842-846.

Equipment and procedures for melting. Effects of gaseous impurities on properties. Graphs, photographs, micrographs. 6 ref. (C21, Q general, Ti)

76-C. (German.) **Continuous Casting of Zinc Ingots.** Heinrich Josef Baggeler and Bernhard Trautmann. *Zeitschrift für Metallkunde*, v. 46, no. 12, Dec. 1955, p. 849-854.

Equipment and methods, construction of casting conveyer, capacity data. Photographs, diagram. 1 ref. (C5, Zn)

77-C. (Book.) **Carbon Technology Related to Aluminum Production.** S. W. Martin and H. W. Nelson. 50 p. Great Lakes Carbon Corp., Research and Development Department, Morton Grove, Ill.

Principles and practice in electrolytic reduction of alumina. Manufacture and properties of carbon anodes. Diagrams, micrograph, photographs, tables. 57 ref. (C23, Al)

D
Ferrous Reduction and Refining

63-D. (English.) **Jointed Metal Furnace Hearths and Regulators (System Javelle).** *Aciers fins & spéciaux français*, no. 21, Nov. 1955, p. 66-70.

Expanding usage of jointed hearths and regulators. Diagrams, photographs, table. (D2)

64-D. (English.) **Rate of Desulphurization of Molten Iron by Slag Under Reducing Condition.** Tunezo Saito and Yasuji Kawai. *Science Reports of the Research Institutes, Tohoku University*, ser. A, v. 7, no. 4, Aug. 1955, p. 402-410.

Rate of transfer of sulfur across a metal-slag interface under reducing condition was studied at temperature range from 1440 to 1570° C., using radioactive sulfur, S^{35}. Net rate of transfer from metal to slag increased with increasing basicity of slag and with temperature. Diagrams, graphs, tables. 7 ref. (D general, P12, Fe)

65-D. (Czech.) **Improving the Efficiency of Ingot Hot-Tops and Risers Through the Use of Exothermal or Insulating Materials ("Lunkerites").** Karel Hybek. *Hutnik*, v. 5, no. 10, Oct. 1955, p. 291-293.

Compositions, properties and methods for using various "lunkerites" used in steel foundry and casting practice. Tables, graph. 7 ref. (D9, E22, ST)

66-D. (Czech.) **Hydrogen in Steel.** Miroslav Sicha. *Hutnik*, v. 5, no. 10, Oct. 1955, p. 302-305.

Types of charge, impurities, furnace linings, slags and other factors in which hydrogen affects properties of steel. 9 ref. (D2, D5, N15, ST)

67-D. (Polish.) **Development of Techniques in Soviet Steel Works and Rolling Mills.** Leonid Andrejew. *Wiadomosci hutnicze*, v. 11, no. 11, Nov. 1955, p. 335-341.

A progress report on engineering, techniques, production, research and other activities in the Soviet steelmaking industry during the last three years. Photographs, table. 1 ref. (D general, F23, ST)

68-D. (Swedish.) **An Investigation of Pastes Used in Söderberg Electrodes for Electric Steel Furnaces.** K. N. Cederquist. *Jernkontorets annaler*, v. 139, no. 11, 1955, p. 893-922.

Results of investigation of more than 20 pastes tested in an effort to determine reasons for explosions in furnaces, due to unsatisfactory composition of pastes, and development of a simple test method for control of pastes delivered to steel mills. Tables, diagrams, graphs. (D5, ST)

69-D. A Resume of Blast Furnace Refractories. Hobart Kraner. *Blast Furnace and Steel Plant*, v. 44, Jan. 1956, p. 55-60.

Requirements for various parts of the furnace, including hearth, bosh and stack. Graphs. (D1)

70-D. Blast Furnace Investigations of Melting and Tapping by the Use of Radioactive Isotopes. Walter Loorz and Heinz Weber. *Blast Furnace and Steel Plant*, v. 44, Jan. 1956, p.64-66, 68.

Method and results of investigation to determine action of pig iron in the hearth. Findings show that the pig iron lies in layers. Graphs. 8 ref. (D1, S19, Fe)

71-D. Automatic Selective Charging System Increases Output. *Blast Furnace and Steel Plant*, v. 44, Jan. 1956, p. 67-68.

Device equalizes flow of gases in blast furnace, thus insuring full activation of the charge. Photographs. (D1)

72-D. Electricity Now Being Employed for Hot-Topping. Frank Nicholson. *Blast Furnace and Steel Plant*, v. 44, Jan., 1956, p. 75-78.

Unit and economic advantages. Diagrams, photographs, (D9)

73-D. LD-Process of Steelmaking With Oxygen Jet. Herbert Trenkler and H. F. Hautmann. *Metal Progress*, v. 69, Jan. 1956, p.49-56.

Outlines process and describes properties of resulting steels. Economic and operational advantages cited and compared with other processes. Graphs, photographs, diagram, tables. 1 ref. (D8, ST)

74-D. The First Successful Bessemer Steel. Karl Fredrik Goransson. *Metal Progress*, v. 69, Jan. 1956, p. 85-87.

A discussion of Bessemer's equipment and set-up in Sweden, and how tuyeres were enlarged so that much more air at lower pressures could be blown through the molten pig iron. Micrograph, photographs. (D3, A2, ST)

75-D. Vacuum Remelting of Superalloys by the Consumable Electrode Process. W. W. Dyrkacz. *Steel Horizons (Technical Section)*, v. 17, Fourth Quarter 1955, 4 p.

Advantages of such remelted materials over air melting processes include lower gas content, improved cleanliness, tensile properties and high-temperature mechanical properties. Tables, photographs, micrographs, diagram. (D8, SG-h)

76-D. Production of High Boron Steel. G. D. Bagley and F. E. Bacon. *U. S. Atomic Energy Commission*, TID-5212, Sept. 1955, p. 155-156.

Results of laboratory induction furnace heats showed that 1.5% of boron can be added to steel with good recovery and without impairing its forgeability. 2 ref. (D6, ST, B)

77-D. Injection of Oxygen-Enriched Air Into Blast Furnace Hearth. Kuro Kanamori. *Henry Brutcher Translation* No. 3618 4 p. (Abstract from *Tetsuto Hagané* v. 40, no. 7, 1954, p. 665-675.) Henry Brutcher, Altadena, Calif.

Sulfur, manganese and silicon contents of blast furnace iron. Slag control and dechroming of ores containing nickel and chromium. Graphs, diagram. (D1, Fe)

78-D. Effect of Coke Circulation on Coke Consumption in Blast Fur-

naces. I. P. Bardin, M. Ya. Ostroukhov, L. Z. Khodak and L. M. Tsylev. *Henry Brutcher Translation No.* 3621, 20 p. (Abridged from *Izvestiya akademii nauk SSSR, OTN,* 1955, no. 1, p. 80-95.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 214-D, 1955. (D1)

79-D. Vacuum and Pressure Melting of Iron-Base Alloys. E. R. Morgan and D. N. Frey. Paper from "Vacuum Metallurgy". Electrochemical Society, Inc., p. 61-66.

Operational experiences and techniques of an alloy development group. Types of furnaces used, procedures, advantages. Diagrams, tables. (D8, Fe)

80-D. (French.) **Use of Dolomite in Basic Open-Hearth Steel.** W. Bading. *Centre de documentation sidérurgique, circulaire d'informations techniques,* v. 12, no. 11, 1955, p. 2039-2062.

Comprehensive review of dolomite as a refractory material for the basic purifying process and its application in practice. Tables, diagrams, photographs, micrographs, graphs. 17 ref. (D2, ST)

81-D. (French.) **Problems Connected With Burning of Converter Bottoms.** H. Wübbenhorst. *Centre de documentation sidérurgique circulaire d'informations techniques,* v. 12, no.11, 1955, p.2091-2106.

Factors influencing rate of burning. Obtained results permit set up of optimum conditions for operation, quality of material and methods of construction for longer life of converter bottoms. Tables, diagrams, graphs, photographs. 11 ref. (D3, ST)

82-D. (French.) **Sensitivity of Converter Bottom to Cooling.** P. Delong. *Centre de documentation sidérurgique, circulaire d'informations techniques,* v. 12, no. 11, 1955, p. 2107-2108.

Relationship between thickness of bottom and number of charges before relining was necessary. Tables, graph. 2 ref. (D3, ST)

83-D. (French.) **Refractory Bricks for Basic Bessemer Converters.** M. Lellig. *Centre de documentation sidérurgique, circulaire d'informations techniques,* v. 12, no. 11, 1955, p. 2215-2220.

Composition, physical and chemical characteristics of different types of refractory bricks. Tables. (D3, ST)

84-D. (French.) **Characteristics of the Temperature Curve at the End of Dephosphorization.** M. Trentini. *Centre de documentation sidérurgique, circulaire d'informations techniques,* v. 12, no, 12, 1955, p. 2379-2387; disc., p. 2387.

Discusses final temperature plateau, chemical explanations of the curve, variation of phosphorus content of the steel and total iron content of the slag as a function of temperature and of the length of the plateau. Graphs. (D general, P12, Fe, ST)

85-D. (French.) **Factors That Influence the Results Furnished by the Galey Opacimeter.** M. Gombert. *Centre de documentation sidérurgique, circulaire d'informations techniques,* v. 12, no. 12, 1955, p.2389-2398; disc., p. 2398-2402.

Influence of both temperature and quantity of charged lime on phosphorus content of the metal and on iron content of the slag at the moment of maximum opacity of the smoke. Tables, graphs. (D general, P12, Fe)

86-D. (Japanese.) **Studies on Prevention of Coke Sulfur From Permeating Into Pig Iron.** Tsunetaro Kato, Kenjiro Takeshita and Takahiro Tsutsiu. *Fuel Society of Japan, Journal,* v. 34, no. 343, Nov. 1955, p.629-632.

Sodium carbonate and/or sodium cyanide was effective as an agent for desulfurizing pig iron. Micrographs. (D1, E10, Fe)

87-D. (Russian.) **Kinetics of Iron Oxide Reduction by Gaseous Reducing Agents at Low Temperatures.** A. G. Moskvicneva and G. I. Chufarov. *Doklady akademii nauk SSSR,* v. 105, no. 3, Nov. 21, 1955, p. 510-513.

Investigation conducted with iron ores in an atmosphere of hydrogen and carbon monoxide. Graphs. 11 ref. (D general, Fe)

88-D. (Russian.) **Ferromanganese Smelting, Using Carbonate Manganese Ores From the Chiatur-Deposit.** A. Iu. Arsenishvili, S. G. Boiko, M. A. Kekelidze, V. V. Perova, B. F. Filonenko and A. N. Tsaritsyn. *Izvestiia akademii nauk SSSR, otdelenie tekhnicheskikh nauk,* 1955, no. 11, Nov., p. 5-12.

Distribution of manganese and phosphorus among melting products. Comparison of results in blast furnace, using usual charge and charges with carbonate ores. Tables. 8 ref. (D1, Fe, Mn)

89-D. Soda Ash Desulphurization. C. E. A. Shanahan. *Iron & Steel,* v. 29, Jan. 1956, p. 9-14.

Ladle process as practiced at nine British works. Most plants found the process satisfactory, but in some of the older works it was discontinued because of deleterious effect on mixer or on openhearth refractories, or because of sulfur fumes. In general, it was found to be very efficient in plants where there were adequate arrangements for skimming off the soda slag and removal of fumes. Tables, graphs. 1 ref. (D general, A8, Fe)

90-D. Desulphurization and Deoxidation of Steel Melts. W. A. Fischer and H. Engelbrecht. *Iron & Steel,* v. 29, Jan. 1956, p. 19-20, 32.

Studies using a lime + 10% calcium fluoride crucible in an induction furnace. Silicon additions were made to steels containing various amounts of carbon and rates of removal of sulfur and oxygen were determined. Graphs, table. 3 ref. (D general ST)

91-D. A Wide-Field High-Temperature Periscope. Charles Burns. *Society of Instrument Technology, Transactions,* v. 7, Dec. 1955, p. 137-146.

Water-cooled furnace - scanning periscope which gives an interior view in an openhearth furnace for visual or photographic observations. Entire furnace interior may be viewed from a single point of insertion. Diagrams, photographs. 3 ref. (D2, S18, ST)

92-D. Hot Cropping for Top Ingot Yield. *Steel,* v. 138, Jan. 30, 1956, p. 92.

Equipment and procedure for hot cropping corru . ted ingots. Saves time and labor, giving maximum yield of fine products. Photograph. (D9, ST)

93-D. (French.) **Some Aspects of the Preparation of Ferro and Silicomanganese in the Electric Furnace.** *Journal du four electrique,* v. 64, no. 6, Nov.-Dec. 1955, p. 193-195.

Economic and practical advantages of electric furnace production over blast furnace production. Photograph. (D5, D1, Fe-n)

94-D. (Spanish.) **Influence of Charging Materials, Energy Carriers, and Economic Factors on the Selection of the Process for Obtaining Steel.** Ernst Krebs and Karl Heinz Schnittger. *Instituto del hierro y del acero,* v. 8, no. 39, Oct. 1955, p. 475-495.

Blast furnace, bessemer and electric steelmaking processes from above points of view. Graphs, tables. 35 ref. (D1, D3, D5, ST)

E

Foundry

83-E. Frozen-Mercury Patterns. Irvin D. Kramer. *Aircraft Production,* v. 17, Dec. 1955, p. 494-497.

Use of frozen mercury for patterns in precision casting offers advantages of low volumetric change in melting and a high rate of self-diffusion which gives it the property of self-welding. Quite large investment castings can be made by using the frozen-mercury process and very complex internal forms, passages and undercuts can be produced. This property makes it possible to eliminate much complex machining and finishing. Photographs, diagrams. (E15, Ni)

84-E. Induction Melting. F. S. Leigh. *Metal Industry,* v. 87, Dec. 16, 1955, p. 503-506.

Differences arising from the application of a mains frequency supply at 50 or 60 cycles for energizing the furnace instead of using a frequency of 500 cycles or over. Diagrams, photographs, graphs. (E10, Al, Cu, Fe, Ni, Cr, AY)

85-E. Moulding Machines. J. B. McIntyre. *Metal Industry,* v. 87, Dec. 16, 1955, p. 506-507.

Description and general survey of the various types of molding machines. Assessment of the main feature of each type. Photographs. (E19)

86-E. We Had To Be Taught How To Use Investment Castings. Carl Benson. *Precision Metal Molding,* v. 14, Jan. 1956, p. 38-40, 79.

Investment casting reduces manufacturing costs and gives designer a degree of freedom not possible by other manufacturing methods. Photographs. (E15)

87-E. Vacuum Die Casting. . .A Progress Report. *Precision Metal Molding,* v. 14, Jan. 1956, p. 45-46.

Review of advantages of a new process by which zinc alloy castings are produced under vacuum. Photographs. (E13, Zn)

88-E. Quality Control of Investment Castings. Charles Yaker. *Precision Metal Molding,* v. 14, Jan. 1956, p. 47, 79-80.

Eight control requirements which must be agreed upon by buyer and vendor to produce aircraft quality investment castings. (To be continued.) (E15, S general)

89-E. Permanent Mold. . .Casting Process With a Future. *Precision Metal Molding,* v. 14, Jan. 1956, p. 48-51.

Reasons for increased use and advantages of this process. Photographs. 1 ref. (E12)

90-E. Expendable Pattern Materials for Investment Casting. C. D. Murphy, Jr. *Precision Metal Molding,* v. 14, Jan. 1956, p. 52-54, 82-85, 89-90.

Technical report on properties and characteristics of waxes. Graphs, photographs, tables. (E15)

91-E. (French.) **Production of Dense Pieces in Light Alloy.** *Fonderie,* 1955, no. 118, Nov., p. 4786-4787.

Choice of alloy, preparation, molding, inspection, repair. 2 ref. (E general, EG-a)

92-E. (French.) **Chill Casting of Brass. Preparation of the Alloy.** *Fonderie,* 1955, no. 118, Nov., p. 4788-4789.

Composition of brasses; calculation of zinc addition. (E11, Cu)

93-E. (French.) **Precision Casting, a Competitor of Machining.** K. W.

Heimann. *Métallurgie et la construction mécanique,* v. 87, no. 11, Nov. 1955, p. 875 + 5 pages.

Comparative review of the lost wax, Croning and Shaw processes. Photographs, graph. (E15)

94-E. (German.) **Experience With Hot Blast Cupola Furnace in the Foundry.** W. Heinrichs and W. Brüker. *Technische Mitteilungen Krupp,* v. 13, no. 6, Oct. 1955, p. 122-132.

Determination of thermal balance; application of recuperator's excess top gases; physical and chemical investigation of properties of pig iron smelted under basic slag; solubility of iron in relation to hydrogen, oxygen, CO and CO_2; nitrogen gases; basicity of slag. Graphs, photographs, table, diagram. 11 ref. (E10, CI)

95-E. (Italian.) **Addition by Immersion in Foundry Practice.** *Fonderia,* v. 4, no. 10, Oct. 1955, p. 477-484.

Method for adding magnesium powder to cast iron melts for desulfurization forming 100% nodular cast iron. Tables, diagrams, graphs. (E25, CI, Mg)

96-E. (Italian.) **Synthetic Molding Sands in the Foundry.** G. C. de Angelis. *Fonderia,* v. 4, no. 11, Nov. 1955, p. 503-515.

Describes sand base, bentonite and preparation, properties and characteristics of synthetic molding sand. Photographs, micrographs, diagrams, graphs. 13 ref. (E18)

97-E. Electric Furnace Melting of Copper. G. J. Brittingham. *Australasian Engineer,* 1955, Nov., p. 58-62, 73-74.

Reasons for the trend towards the use of electric furnaces in the melting of copper; suitable types of furnaces. A brief history of development is traced through a review of various installations. Diagram, graphs, tables. 12 ref. (E10, CU)

98-E. An Introduction to Shell Moulding. W. A. Cleary. *Australasian Engineer,* 1955, Nov., p. 63-68.

Fundamentals and development. Evaluates process from foundryman's viewpoint, appraises published literature on the subject. Photographs. 17 ref. (E16)

99-E. Recent Developments in the CO_2 Process. Waldemar Schumacher. *Foundry,* v. 84, Jan. 1956, p.88-93.

Results of studies of thermal conductivity, gas evolution, collapsibility and rinse of sand bonded by carbon-dioxide gas. Graphs, photographs. 4 ref. (E18)

100-E. Modern Facilities Incorporated in New British Foundry. Vincent Delport. *Foundry,* v. 84, Jan. 1956, p.94-99.

Modern foundry planned to produce 240 tons of castings per week. The plant is noteworthy for its efficient layout, ample space, good lighting and ventilation. Photographs. (E general, A5)

101-E. Casting Facilities Prominent in New Westinghouse Pilot Plant. Kenneth L. Mountain. *Foundry,* v. 84, Jan. 1956, p. 100-103.

Shell mold and investment casting facilities are prominent part of a newly completed metals processing laboratory. Photographs. (E16, E15)

102-E. Medium-Size, High-Production Foundry Makes Meter Castings. Robert H. Herrmann. *Foundry,* v. 84, Jan. 1956, p. 104-108.

High-production foundry making brass and aluminum castings used in heating equipment and in meters for handling various liquids. Photographs. (E general, Al, Cu)

103-E. Patterns for Thin-Wall Castings. R. H. Weston. *Foundry,* v. 84, Jan. 1956, p.109

New low-cost method applicable to both simple and complex type of patterns. Diagrams. (E17)

104-E. Fluidity of Molten Cast Iron. E. R. Evans. *Foundry Trade Journal,* v. 99, Dec. 29, 1955, p. 757-763.

Methods used and main points emerging from investigation of the fluidity; significance of results to foundryman. Graphs, diagrams, photograpns, tables. 3 ref. (E25, CI)

105-E. Gases in Cast Iron. H. Morrogh. *Foundry Trade Journal,* v. 99, Dec. 29, 1955, p. 765-773.

Results from studies of the effect of varying oxygen and nitrogen contents of commercial melts. Graphs, micrographs, photographs, tables. 33 ref. (E25, CI)

106-E. Can Precision Casters Meet Gas Turbine Needs? *Iron Age,* v. 177, Jan. 12, 1956, p. 80-82.

Problems and requirements of casting as a production method for turbine parts. Photographs. (E15)

107-E. Does Sand Testing Give Us the Facts? J. S. Schumacher, E. H. King, and R. W. Heine. *Modern Castings,* v. 29, Jan. 1956, p. 30-33.

Suggests reducing weight of rammer used in laboratory testing of molding sands to produce hardness approximating that of molds produced in foundry by jolting or squeezing. Photograph, table, graphs. (E18, E19)

108-E. Direct Arc Furnace Doubles in Bronze. T. R. Stanley. *Modern Castings,* v. 29, Jan. 1956, p. 34-35.

Methods for using same electric steelmaking furnace for producing bronze castings as well as steel. Advantages stated. Table, photographs. (E10, D5, ST, Cu)

109-E. Case Study Report on 3 Small Gray Iron Shops. *Modern Castings,* v. 29, Jan. 1956, p. 41-56.

Condensation of U. S. Department of Labor study of typical small foundries. Covers three foundries employing 53, 47 and 53 workers respectively, describing methods of operation of each, problems encountered, how these problems are handled. Tables, diagrams, photograph. (E general, CI)

110-E. How to Make Duplicate Patterns With Epoxy Resins. Steven P. Kish. *Tool Engineer,* v. 36, Jan. 1956, p. 85-87.

Epoxy patterns offer large savings in time and money, result in ease of handling and storing both the raw materials and finished molds. Diagrams, photograph. (E17)

111-E. Centrifugal Casting of Tubular Steel Shapes. F. Wiesner. *Henry Brutcher Translation No.* 3576, 12 p. (From *Slévarenstvi,* v. 3, no. 2, 1955, p. 44-47.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 180-F, 1955, (E14, CI)

112-E. Operation of the Hot-Blast Cupola. W. Haas. *Henry Brutcher Translation No.* 3581, 7 p. (Abridged from *Giesserei,* v. 42, no. 11, 1955, p. 291-292.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 292-E, 1955. (E10, CI)

113-E. Experimental Application of Waterglass When Making Foundry Molds. P. I. Shportenko. *Henry Brutcher Translation No.* 3622, 6 p. (From *Liteinoe proizvodstvo, 1953,* no. 8, p. 17-18.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 98-E, 1954. (E19)

114-E. Hot Tearing Tendency of Austenitic Manganese Cast Steel From Remelt Heats. F.-C. Althof. *Henry Brutcher Translation No.* 3629, 24 p. (Abridged from *Giesserei,* v. 42, no. 14, 1955, p. 362-370.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 319-E, 1955. (E10, E25, CI)

115-E. Degassing of Metal Melts by Vacuum Treatment. O. Winkler. *Henry Brutcher Translation No.* 3634, 17 p. (Condensed from *Vakuum-technik,* v. 3, no. 5, 1954, p. 87-96.) Henry Brutcher, Altadena, Calif.

Reviews theory, equilibria and reaction rates, and results in deoxidizing copper. Tables, graphs, diagrams, photograph. 8 ref. (E25, C25, Cu)

116-E. (French.) **Foundry Defects.** J. Pascal. *Métallurgie et la construction mécanique,* v. 87, no. 12, Dec. 1955, p. 959, 961.

Identification and classification of different types of defects. (To be continued.) (E general)

117-E. (German.) **Investigation of Plasticity Measurement of Non-Compressed Molding Sand.** Heinz Siegel. *Giesserei,* v. 42, no. 25, Dec. 8, 1955, p. 686-691.

Plasticity measured by a plasticimeter which determined kneading properties of the sand. Graphs, diagram. 2 ref. (E18)

118-E. (German.) **Behavior of Steel During Solidification.** Werner Trommer. *Giesserei,* v. 42, no. 26, Dec. 22, 1955, p. 708-715.

Behavior after casting, means of control for desired solidification. Tables, graphs, diagrams, photographs, X-ray pictures. 42 ref. (E25, CI)

119-E. (Russian.) **Obtaining High-Quality Cast Iron From the Cupola.** I. B. Khazan. *Liteinoe proizvodstvo,* 1955, no. 11, Nov., p. 4-7.

Regulation of melting process, desulfurizing and degasifying components of the slag, analysis of slags of various types and at various stages of the process, temperature control. Tables, diagrams. (E10, CI)

120-E. (Russian.) **Use of Scrap Cast Iron in the Charge of Malleable Cast Iron.** A. P. Shakhov and S. S. Krasnovskaia. *Liteinoe proizvodstvo,* 1955, no. 11, Nov., p. 25-27.

Chemical composition, mechanical properties, and microstructure compared for usual malleable cast iron and that with scrap cast iron in charge. Better control of silicon content, less rejects, other advantages when this charge is used. Graphs, tables, micrographs. (E10, CI)

121-E. (Swedish.) **Buildings for Melting Departments.** V. Almborg. *Gjuteriet,* v. 45, no. 12, Dec. 1955, p. 173-176.

Design considerations for cupola and electric induction melting departments. Diagrams, photographs. (E10, A5)

122-E. Risering of Gray Iron Castings. E. J. Sullivan, Jr., C. M. Adams and H. F. Taylor. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 8-12.

Effects of carbon, silicon and other elements on shrinkage behavior, relationship between shrinkage, graphite structure and mold dilation. Tables, diagram, graphs, micrographs. 2 ref. (E22, Fe)

123-E. Range of Effectiveness of Chills. Victor Paschkis. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 13-16.

Decreasing influence of a chill on the surface of a large cast slab. Graphs, diagram. (E25, ST)

124-E. Principles Applicable to Vertical Gating. K. R. Grube and J. G. Kura. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 35-48.

Improved gating system applicable to permanent, shell or sand molds

of appreciable height. Tables, photographs, diagram, graphs. 18 ref. (E22, Al)

125-E. Current Status of Test Patterns for Evaluation of Sand Mixtures. Charles Locke. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 49-62; disc., p. 62.

Review of literature concerning design and function of test patterns that have been and are being used. Diagrams, photographs, graph, tables. 46 ref. (E18)

126-E. Development in the Light Castings Industry Including the New Die Pressing Process. R. S. M. Jeffrey. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 63-70.

Pedestal grinder, collection of cupola dust, anomalies in fluidity, enamel blistering, mechanization and the die pressing process. Diagrams, tables, photographs, micrographs. 10 ref. (E general, E13)

127-E. Monolithic Converter Linings. J. Davies. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 71-75.

Converter lining life has been extended by using rammed quartz (bonded with bentonite) graded to a maximum packing density. Methods for adjusting the grading, ramming, drying and patching. Diagrams, photographs, graphs, tables. 3 ref. (E10, D3)

128-E. A Critical Analysis of the Cylindrical Standard Test Specimen for Foundry Sands. Walter Goetz. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 76-95; disc., p. 96-98.

Alterations of strength and permeability caused by varying the moisture content of the test specimen are valid in the foundry mold if a sand is tested according to the AFS method. Graphs, photographs, tables. 28 ref. (E18)

129-E. The Influence of Molding Materials on the Incidence of Hot Tearing. J. M. Middleton. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 99-108.

Incidence of hot tearing was greater in test molds bonded with organic materials than in those bonded with clay. Photographs, graphs, diagrams, tables. 4 ref. (E18, ST)

130-E. Dissolved Gas in Liquid Cast Iron. Wm. Y. Buchanan. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 109-114; disc., p. 114-115.

Method of collecting gas for analysis and for measuring rate of evolution. Diagrams, graph, photograph, tables. (E25, CI)

131-E. The Scabbing Defect. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 123-142.

Report of test data evaluating the effects of sands (No. 35 through 52) on scabbing tendencies. Photographs, tables, graphs, diagram. 2 ref. (E18)

132-E. Dimensional Tolerances and Surface Structure in Various Shell Cast Metals. Richard A. Flinn, Walter B. Pierce, Floyd R. Smith and Paul F. Youngdahl. *American Foundrymen's Society,* v. 63, 1955, p. 143-156.

Investigation and evaluation of the surface quality, dimensional variation and surface microstructure obtainable in shell molded castings. Photographs, micrographs, graphs, tables, diagram. 1 ref. (E16, M27)

133-E. Forehearth Refractories for Soda Ash Desulphurizing. Sam F. Carter and Ralph Carlson. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 170-176; disc., p. 176.

Tests types of materials and properties that affect soda resistance. Tables, diagrams, photographs. (E10)

134-E. Pressure Molding Influences on Pattern and Rigging. T. E. Barlow and W. J. Burk. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 191-194.

Requirements for patterns, flasks and rigging are normal. (E17, E22)

135-E. Application of Refractories in the Foundry. F. H. Fanning. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 195-198; disc., p. 198.

Compares power press, extrusion and air-rammed high-duty and super-duty fireclay and high-alumina brick refractories. Tables. (E10)

136-E. An Investigation of Precision Casting of Experimental Propellers. A. R. Willner, S. Goodman and C. L. Tippett. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 199-202.

Model aluminum propellers were precision cast to specifications. Describes a dispensable wax pattern, dewaxing under steam pressure, low-temperature investment mold drying and a casting technique utilizing a partial vacuum and inert gases. Photographs, diagram. 1 ref. (E15, T24, Al)

137-E. Vapor Holes From Loose Sand Grains in Brass and Bronze Castings. Floyd Keller and W. B. George. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 217-219; disc., p. 219-222.

Vapor holes appearing in brass and bronze castings as a result of sand grains entrapped during solidification. Photographs, micrographs. (E23, E25, Cu)

138-E. The Meaning of the Cast Test Bar in the Evaluation of Aluminum and Magnesium Alloy Castings. A. G. Slachta and H. Mansfield. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 223-232; disc., p. 232.

Evaluations of test bar relationships to the castings they represent were made using an Al-Cu-Si alloy (AMS 4214 or SC51A-T71) and a rare earth magnesium alloy (WAD 6495 or EZ 33A-T5). Graphs, micrographs, tables, photographs. 3 ref. (E25, Al, Mg)

139-E. Microporosity in Gun Metal Pressure Castings. A. H. Hesse, M. Glassenberg, and W. H. Baer. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 233-242; disc., p. 242-243.

Melt quality, gates, risers and pouring temperature can be varied to minimize microporosity in definite regions. Diagrams, photographs, tables. (E25, Cu)

140-E. A Simplified Method for Determining Riser Dimensions. H. F. Bishop, E. T. Myskowski and W. S. Pellini. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 271-281.

Caine's risering method may be replaced with shape factors expressed in terms of length, width and thickness of the casting. Minimum riser dimensions can be determined for complex shapes featuring appendages and for shapes involving retarded cooling rates. Diagrams, tables, photographs, graphs. 6 ref. (E22, ST)

141-E. What Design Engineers Look for in Castings. Trevor Davidson. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 282-286.

Includes diagrams, photographs. (E general)

142-E. Risering of Commercial Steel Castings. Charles W. Briggs. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 287-290.

Method for computing riser dimensions for castings. Diagrams, graphs. (E22, CI)

143-E. Application of Indirect Chills. Charles Locke. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 291-292.

Use of indirect chilling for two production castings. Photographs. 5 ref. (E25)

144-E. Risering Requirements of Nodular Iron. R. C. Shnay. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 293-294.

Includes radiographs, table. (E22, CI)

145-E. Application of Chills for Neutralization of Rib and Boss Hot Spots on Plates. E. T. Myskowski and H. F. Bishop. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 295-300.

Chart method developed for determining chill thickness necessary to neutralize appendages which develop hot spot conditions. Radiographs, diagrams, tables. 4 ref. (E25, CI)

146-E. Measurement of Gas in Molten Aluminum. H. Rosenthal and S. Lipson. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 301-305.

Under standard test conditions, a correlation can be established between the densities of atmospherically solidified and reduced-pressure solidified aluminum alloys removed from the same heat at the same time. Gas volume lost during reduced-pressure solidification is related to the gas content of the initial melt. Photographs, graphs, diagram. 9 ref. (E25, Al)

147-E. Casting Finish as Affected by Sand Additives. Burdette Jones. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 307-312.

Includes photographs. (E18)

148-E. Metallurgical Requirements and Production Techniques for Titanium Castings. D. I. Sinizer and C. M. Adams, Jr. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 313-316.

Handling of liquid titanium, refining and remelting, skull melting, gating, furnaces and molds. Graph, photographs, diagram. (E general, Ti)

149-E. Sealing Metal Coreboxes Against Blow-By. Richard L. Olson. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 325-326.

Dike-type seal which maintains consistent core permeability and eliminates blow-by. Photographs. (E21)

150-E. Application of Insufficient Chills. E. C. Troy. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 327-329.

Insufficient chills used to promote solidification control, by gradient heat extraction, were found to be practical. Graph, diagrams, photographs, radiographs. (E25, CI)

151-E. Metallurgical Controls for Duplexed Malleable Iron. Lawrence E. Emery. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 330-335.

Includes photograph, tables, graphs, micrographs. (E25, CI)

152-E. Development of a Bottom Pour Ladle Practice. A. W. Fastabend. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 336-338; disc., p. 339.

Refractory linings for ladles. Photograph, table, graph. (E23)

153-E. Ladle Practice. Arthur P. Guidi. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 340-344; disc., p. 344.

Ladle practice, without regard to theory, at an electric steel casting company. Photographs, graph. (E23, CI)

154-E. Improvement of Pressure Tightness and Tensile Properties of Gun Metal Bronze by Vacuum Degassing. W. H. Johnson, H. F. Bishop and W. S. Pellini. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 345-352; disc., p. 353-354.

Equipment and operational variables for degassing gun metal bronze melts in a vacuum chamber. Graphs, diagrams, tables, micrographs, photograph. (E10, Cu)

155-E. Shell Molding Process and Equipment. J. Sutherland and C. O. Schopp. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 355-362.

Advancements in shell molding by equipment manufacturers and foundry operators. Photographs, diagrams. (E16)

156-E. Pressure Pouring and Graphite Permanent Molds Used in Production of Steel Car Wheels. H. H. Hursen. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 367-372.

Molten steel is forced through a refractory tube from the ladle to the graphite permanent mold by compressed air. Photographs, diagram. (E12, T23, ST)

157-E. Coreroom Practice Pitfalls. R. H. Greenlee. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 373-376.

Core requirements, core sand additives, coreroom supervision, raw materials, core scrap. Photographs. (E21)

158-E. Gypsum Cement Molds for Plastic Patterns. M. K. Young. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 377-382.

Production methods for rapid, accurate, nexpensive gypsum cement moldmaking. Photographs. (E17, E19)

159-E. Engineering Methods in Practical Sand Problems: Strength—Density Relationships. V. E. Zang and G. J. Grott. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 383-388.

Basic stress calculations may be applied to molding sand mixtures. Bond strength and the coefficient of intergranular friction may be evaluated at any given density of the sand mixture. The bond strength to friction ratio reflects the sand mixture "moldability". Graphs, diagrams. 5 ref. (E18, E19)

160-E. Feeding Range in Shell Molds. R. E. Morey, H. F. Bishop and W. S. Pellini. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 419-424; disc., p. 424.

Riser feeding range can be determined by radiography for alloys that develop centerline shrinkage. Feeding range values for aluminum and bronze alloys (containing dispersed porosity) can be determined by hydraulic pressure tests. Data obtained for conventional sand mold castings can be applied to shell mold castings. Radiographs, graphs, table, photograph. 14 ref. (E23, E16)

161-E. General Motors Experimental Foundry. Louis J. Pedicini. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 434-441.

Special features of the foundry. Photographs, diagram. (E general, A5)

162-E. Make Plaster Cores in Rubber-Lined Boxes. Robert F. Dalton. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 442-445.

Advantages and disadvantages of rubber-lined core boxes for plaster molding, with a description of the core-box lining process. Photographs. 2 ref. (E21)

163-E. A New Foundry Core Sand Binder. Charles J. Gogek. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 472-475.

Test results and discussion of a new white, water-soluble binder containing over 90% corn sugar. Tables, photographs, graphs. (E18)

164-E. Precision Patterns From Zircon Molds. J. E. Stock and A. V. Schoville. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 476-479.

Includes photographs. (E17, CI)

165-E. Reactions During Core Baking. Gerald J. Grott and Howard F. Taylor. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 493-502.

Critical survey of work done in the field. Tables, graphs, photographs. 21 ref. (E21)

166-E. Fluidization-Injection Process for Desulphurizing and Upgrading Cast Iron. G. P. Dahm, H. C. Barnes and C. E. Bieniosek. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 511-520; disc., p. 520-523.

Effects of nitrogen injection of calcium carbide on sulfur content, chill, fluidity, machinability and other physical properties of cast iron. Effects of gaseous injection of upgrading agents. Photographs, graphs, micrographs, tables. (E25, CI)

167-E. Calcium Carbide Desulfurization by the Injection Process. John A. DeHuff and R. Schneidewind. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 524-530; disc., p. 530-532.

Calcium carbide desulfurization is a rapid and clean method. The efficiency of the reaction is better at the higher melt-in sulfur values. The reaction will occur at temperatures as low at 2300 to 2400° F. Micrographs, graphs, photographs, tables. 8 ref. (E10, CI)

168-E. Increasing Carbon Content of Cast Iron By Ladle Injection. G. E. Spangler and R. Schneidewind. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 533-539; disc., p. 539-540.

Increases up to 1.0% carbon have been made in 3 min. or less by injection process. Recovery efficiencies range from 50 to 100%. Tables, micrographs, graphs. 7 ref. (E23, CI)

169-E. New High Strength Cast Irons Produced by Injection Methods. J. W. Estes and R. Schneidewind. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 541-552; disc., p. 552.

Injection of calcium carbide and rare earth oxides, and/or magnesium oxide can produce upgraded cast irons with as-cast tensile strengths at or above 50,000 psi. The upgraded irons have properties of low hardness, ductility, low chill depth, intensitivity to cooling rate in various sections and low solidification shrinkage. Graphs, tables, micrographs. 7 ref. (E25, Q general, CI)

170-E. Application of Insulated Risers to Production of Aluminum Alloy Sand Castings. W. A. Mader. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 553-550; disc., p. 560-561.

Riser insulation causes reduction of heat losses by conduction and radiation. Advantages and disadvantages of permeable gypsum plaster, expanded perlite and exothermic riser sleeves. Table, photographs, graph. 10 ref. (E22, Al)

171-E. Production of Aluminum Alloy Specification Castings. Roy E. Paine and P. V. Faragner. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 562-568.

Purposes of specifications and the establishment of foundry methods. Effects of remelting, molding and heat treating practices on casting quality. Photographs, table. 2 ref. (E general, S22, Al)

172-E. Clay, Fines, and Water Relationships for Green Strength in Molding Sands. A. H. Zrimsek and R. W. Heine. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 575-581.

Green strength of sand-clay mixtures is sensitive to a clay content of less than 10 to 20%. When present, silica flour fines tie up about 1 to 1.5% bentonite per 1% silica flour and prevent the peak strength (for a given percentage of bentonite) from being obtained. Tables, graphs. 1 ref. (E18)

173-E. Wood Pattern Construction Standards and Specifications. John F. Roth. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 587-588.

Proposed standards and specifications for wood pattern construction. Discusses woods, joints, glues and pattern sizes. (E17)

174-E. Improving Refractory Cost in Malleable Melting. L. E. Emery. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 589-595; disc., p. 595.

Economic importance of refractories used in sidewalls, tap-out blocks, furnace bottoms, ladles, bungs. Tables, diagrams, photographs. (E10, CI)

175-E. A Quantitative Evaluation and Importance of Hydrogen in Aluminum Founding. Dixon Chandley, Clyde M. Adams, Jr., and Howard F. Taylor. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 607-614.

Effect of hydrogen content on tensile properties of 195 alloy; sources of hydrogen; techniques for degassing aluminum. Graphs, tables, photographs. 3 ref. (E general, Q23, Al)

176-E. Risering of Nodular Iron. II. Effect of Silicon Content on Feeding Distance. R. C. Shnay and S. L. Gertsman. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 632-636; disc., p. 636-637.

Sampling for carbon in nodular iron. Variations in silicon content from 2.57 to 3.13% have no appreciable effect on the feeding distance of hypereutectic nodular irons. Hypoeutectic nodular iron plates, ½ to 1½ in. thick, have a shorter feeding distance than hypereutectic plates. Graphs, diagrams, tables. 10 ref. (E22, CI)

177-E. Load Carrying Power of Molding Sands. H. W. Dietert, F. S. Brewster and A. L. Graham. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 642-647; disc., p. 647-649.

Correlates soundness of castings to the load-carrying power of a sand. A sand with a better load-carrying power produces a casting with less tendency toward shrinkage. Graphs, photographs. (E18)

178-E. A Malleable Furnace Refractory Cost Reduction Program. F. J. Pfarr and A. S. Johnson. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 657-661; disc., p. 661.

New method of sidewall construction which is labor saving and prolongs refractory life. Diagrams, photographs. (E10, CI)

179-E. Influence of Vibration on Fluidity and Filling During Investment Casting of an Aluminum Alloy. D. W. Levinson, A. H. Murphy and W. Rostoker. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 683-685; disc., p. 686.

Molten metal was found to enter and to flow through small channels more easily when aided by vibration. Vibration intensity governs the degree of flow. Graph, diagram, photographs, tables. 3 ref. (E23, E15, Al)

180-E. Surface and Internal Bubble Control in Poured Investment Plasters. J. N. Trant and R. G. Megaw. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 689-692.

Pattern surfaces should be covered with a parting compound to insure rupturing of surface bubbles. By blending a separately generated foam with the plaster slurry, resulting internal bubbles will be small, uniform and interconnected. Tables, photographs. 4 ref. (E16)

181-E. Manufacture of High-Quality, Pressure-Tight Steel Castings. John F. Wallace. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 693-702.

Hardening, heat treatment, chemical composition, molding, melting, gating, risering, rough machining and inspection required in the production of pressure-tight steel castings. Graphs, photographs, diagrams. 24 ref. (E11, CI)

182-E. A Case Study of a Premium Strength Casting of 220-T4 Aluminum Alloy. A. J. Carah. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 703-709.

Research, development and production report on a rocket missile fin base cast from a light alloy. Photographs, diagrams, graphs. (E11, T24, Al)

183-E. Microscopy and Molding Sands. V. D. Frechette. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 710-716.

Use of polarizing and stereoscope microscopes to investigate textural characteristics of foundry sands. Graphs, tables, photograph, diagrams. 25 ref. (E18, M21)

184-E. Research in the Patternmaking Industry. David T. Kindt. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 717-719.

Drying and dry film characteristics of pattern coating. Tables. (E17)

185-E. Risering of Ductile Cast Iron. Riser Dimensions, Feeding Distance, and Other Data. R. A. Flinn, D. J. Reese and W. A. Spindler. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 720-724; disc., p. 724-725.

Includes graphs, radiographs, photographs, tables. 2 ref. (E22, CI)

186-E. A Study of Cupola Design and Operating Factors That Influence the Emission Rates From Foundry Cupolas. R. C. Ortgies. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 741-744.

Determination of the exact amount of material discharged from a cupola stack. Discusses factors (bed height, charging doors, stock height, igniters, blower air volume, material handling) which affect dust emission. Diagrams, photographs, tables. (E10, A8)

187-E. Investment Casting by the Frozen-Mercury Process. Irvin R. Kramer and Leonard J. Goldwater. *Archives of Industrial Health,* v. 13, Jan. 1956, p. 29-33.

Frozen mercury is good pattern material because of its self-welding property and its low volumetric change on melting. Adequate health protection of workers is necessary. Photographs. (E15, A7)

188-E. Conversion of Cupolas From Cold to Hot Blast, and Operating Economies. R. Burleigh. *Foundry Trade Journal,* v. 100, Jan. 5, 1956, p. 5-10.

Emphasizes the considerable reduction in fuel consumption which can be affected with the use of hot blast. The direct economics are given, with a description of conversion to hot blast in one particular foundry. Diagrams, photographs, tables. (E10, CI)

189-E. A Yorkshire Die-Casting Foundry. *Foundry Trade Journal,* v. 100, Jan. 5, 1956, p. 21-22.

Special castings described, with emphasis on die design and planning. Photograph. (E13)

190-E. Progressive Mechanization as Applied to Core Making in a Production Foundry. Clifford W. Hockman. *General Motors Engineering Journal,* v. 3, Jan.-Feb. 1956, p. 2-9.

Development and operation of an automatic core blower, for use in foundry of automotive industry, which increases quality and production while saving maintenance and space. Photographs. (E21, CI)

191-E. Bore Cracks. D. E. Brooks. *Iron & Steel,* v. 29, Jan. 1956, p. 15-16.

Summary of study done by U. S. Naval Research Laboratory on defects in cast steel fittings and valve bodies. Factors considered were stresses, design of valve or fitting, gating, chills, hollow cores used in molds, liquid shrinkage, pouring temperature, veins. Diagrams. (E general, Q26, ST)

192-E. Close Limit Diecastings. H. K. Barton. *Metal Industry,* v. 88, Jan. 20, 1956, p. 43-46.

Factors affecting dimensional accuracy, methods of controlling variations. Diagrams. (E13)

193-E. Foundry Headaches Are Being Cured by CO_2. *Metalworking Production,* v. 100, Jan. 20, 1956, p. 93-97.

Method of coremaking in which binder, based on sodium silicate, is added to dry silica sand and the cores are then gassed by passing CO_2 through them. Chemical reaction between binder and CO_2 produces hard bond, hardening the core in a few seconds. No baking or drying is required. Diagrams, photograph. (E19, E21)

194-E. Die-Cast Aluminum Engine Block. *Western Machinery and Steel World,* v. 47, Jan. 1956, p. 89.

Production of world's first aluminum die-cast six-cylinder automobile engine block shows an approximate 10% price advantage over gray iron block which requires fewer secondary operations, since machining is confined to main sealing areas. Superior heat conductivity of aluminum also permits use of less complicated cooling system. Photographs. (E13, T25, Al)

195-E. (French.) Considerations on the Cold Blast Cupola. Francois Danis. *Fonderie,* 1955, no. 119, Dec., p. 4821-4836.

Processes taking place in a cold blast cupola and dimensional characteristics. Graphs, diagrams. 15 ref. (E10, CI)

196-E. (French.) Molding Sand for Thin Pieces. *Fonderie,* 1955, no. 119, Dec., p. 4837-4840.

Role of fineness of grains in the characteristics of molding sands; plasticity measurements; selection and preparation of sand; use of mineral black. Diagrams. (E18)

197-E. (German.) Efficient Grain-Refining Method for Hypereutectic "GAlSi" Alloys. Wolfgang Thury and Hermann Kessler. *Zeitschrift für Mettallkunde,* v. 46, no. 12, Dec. 1955, p. 846-849.

Grain refinement of primary silicon crystals in a hypereutectic aluminum-silicon piston alloy by a new aluminum phosphide and chlorine gas treatment. Maintenance of ideal crystal distribution by repeated gas treatments. Micrographs. 5 ref. (E25, Al, Si)

198-E. (Book.) American Foundrymen's Society, Transactions (Annual Volume), v. 63, 1955, 761 p. American Foundrymen's Society, Golf and Wolf Roads, Des Plaines, Ill.

Papers cover melting, pouring, molding, testing, and other aspects of foundry practice. Papers are individually abstracted. (E general)

F

Primary Mechanical Working

40-F. Close-Tolerance Forgings. George W. Motherwell. *Aircraft Production,* v. 17, Dec. 1955, p. 478-481.

Progress in improvement of accuracy and reduction of machining. Some of the problems of producing forgings with small draft angles and to close tolerances, and some specific examples of work already done. Photographs, diagram. (F22)

41-F. Axle Shaft Manufacture. *Automobile Engineer,* v. 45, Dec. 1955, p. 570-572.

Description and operation of electric upsetting and press forging production unit. Diagrams, photographs. (F22, AY)

42-F. Hot-Rolled Gear Wheels. A. D. Kuzmin, M. V. Vasilchikov, and M. V. Barbarich. *Engineers' Digest,* v. 16, Dec. 1955, p. 575-577. (Translated from *Vestnik Mashinostroyenya,* v. 35, no. 3, Mar. 1955, p. 53-56; no. 9, Sept. 1955, p. 41-44.)

Production process for the hot rolling of gears with a quality entirely satisfactory for engineering purposes. Diagrams, graph. (F23)

43-F. Production of Turbine Compressor Blades by Forging. *Light Metals,* v. 18, Dec. 1955, p. 414-415.

Process for forging titanium blades, for the axial compressor of a prototype gas turbine, which eliminates galling. Diagrams, photographs. (F22, Ti, AY)

44-F. Snap-On Couplings Cut Mill Down Time. *Steel,* v. 137, Dec. 26, 1955, p. 68, 71.

Problem of coupling and uncoupling of fluid lines in roll changes and a solution to this problem which involves quick-connect and disconnect couplings. Diagrams, photographs. (F23, AY)

45-F. (Czech.) New Techniques in the Manufacture of Drawn Wire. Frantisek Palisek. *Hutnik,* v. 5, no. 10, Oct. 1955, p. 305-308.

Advantages, economy, problems of the method. Tables. (F28, Al, Cu, ST)

46-F. (French.) Technological Aspect of the Shaping of Metals by Cold Deformation. Raoul Molle. *Revue universelle des mines,* v. 11, ser. 9, no. 11, Nov. 1955, p. 568-582.

Analysis of the process of cold deformation of metal. Methods of metal forming based on cold deformation such as rolling, stamping, pressing, extrusion and deep drawing. Optimum condition of operation, fields of application, advantages of each method. Graphs, diagrams. 2 ref. (F general, G general)

47-F. (German.) **Investigations on the Lubricity of Cold Rolling Oils, Particularly of Oil Emulsions.** Joseph Billigmann. *Stahl und Eisen,* v. 75, no. 25, Dec. 15, 1955, p. 1691-1701; disc. 1701-1705.

Tests made on ten different emulsion oils as compared with palm oil, undiluted mineral oil and water. Effect of the addition of corrosion inhibitors, variations in the oil composition with different supplies, effect of different fatty acid contents of the emulsions, changes in the properties of the lubricants when rolling with higher speeds, stability of the emulsion oils. Graphs, micrographs, tables. 44 ref. (F1, F23)

48-F. (Polish.) **Mechanization of the Production of Drop-Forged Rings.** Wieslaw Wroblewski. *Wiadomosci hutnicze,* v. 11, no. 11, Nov. 1955, p. 342-347.

Soviet designs of mechanized anvils, hammers and presses for various forging techniques. Diagrams, photograph. 7 ref. (F22, ST)

49-F. (Russian.) **Examination of the Defects of Extruded Nonferrous Semi-Products.** Z. Hegedüs. *Acta Technica Academiae Scientiarum Hungaricae,* v. 13, nos. 1-2, 1955, p. 115-147.

Effects of inclusions and extruding variables on the quality of extruded shapes. Photographs, tables, micrographs. 17 ref. (F24)

50-F. (Slovak.) **Practical Experience in the Use of Plastic Bearings in Steel Rolling Mills.** Frantisek Nuhlicek. *Hutnik,* v. 5, no. 10, Oct. 1955, p. 299-302.

Effect of various types of lubricants with water cooling. Bearing materials and designs. Tables, diagrams. 2 ref. (F23, F1)

51-F. Newest Production Techniques at Chevrolet's Tonawanda Forge Plant. Thomas Mac New. *Automotive Industries,* v. 114, Jan. 15, 1956, p. 66-69.

Manufacturing processes and machines used in a modern forge shop. Diagrams, photographs. (F22, ST)

52-F. Extruding Metal With Glass Lubricants. J. Delcroix. *Metal Progress,* v. 69, Jan. 1956, p. 57-60.

A brief discussion of extruding metal with powdered glass, resulting in easier and faster working conditions, better surface on the extrusion, less power requirement, increased adaptability of the process. Photograph. 1 ref. (F1, F24)

53-F. Large-Section Aluminium Extrusions. *Overseas Engineer,* v. 29, Jan. 1956, p. 218-219.

Developments in aluminum alloy structural, marine and transport fields require larger sections in strong and medium-strength alloys. New British extrusion factory can produce wide range of aluminum sections. Photographs. (F24, T26, A1)

54-F. The Extrusion of Beryllium. E. C. Creutz, D. G. Gurinsky, J. H. Chapin, R. W. Yancey, F. G. Foote, H. Bethke and A. R. Kaufmann. *U. S. Atomic Energy Commission,* TID-5212, Sept. 1955, p. 49-66.

Extrusion into round or rectangular shapes, or into tubing is successful between 1500 and 1900° F. Resulting material has greater strength and ductility than cast metal. Diagrams, photographs, table. 11 ref. (F24, Be)

55-F. (French.) **Soaking Pits. Types of Furnaces, Operation and Maintenance, Recuperation and Control.** M. Courdille. *Centre de documentation sidérurgique, circulaire d'informations techniques,* v. 12, no. 11, 1955, p. 2161-2174.

Existing types of furnaces and recuperators. Operational peculiarities for special types of steels. Critical evaluation of different types of soaking pits. Table, diagrams. 4 ref. (F21, ST)

56-F. (French.) **The Forgeability of Steels.** G. Remy. *Centre de documentation sidérurgique, circulaire d'informations techniques,* v. 12, no. 12, 1955, p. 2413-2419.

Hot tension tests, at different speeds, on various carbon steels and influence of testing speed in forgeability tests, other than hot tension tests. Table. 13 ref. (F22, ST)

57-F. New Economy in Rolling Mill Bearings. R. G. Walmsley. *British Steelmaker,* v. 22, Jan. 1956, p. 10-17.

Production and use of laminated fabric bearings for abnormally rapid wear points in steel rolling mills. Advantages are economies in drive power, shut-down time, lubrication and bearing life. Photographs, table, diagrams, graphs. (F23, ST)

58-F. Moh i Rana. Norway's Promise of Self-Sufficiency. *British Steelmaker,* v. 22, Jan. 1956, p. 20-22, 24.

Rolling mill plant and equipment at the completely integrated plant built by Norwegian government as part of a long-range plan to be self-supporting in production of steel. Photographs. (F23, A5, ST)

59-F. Tube Straightening. *Iron and Steel,* v. 29, Jan. 1956, p. 26.

New high-speed machine developed for use in production of high-grade, hot finished steel tubes for oil pipe lines. Can handle very large diameter work. Photographs. (F29, ST)

60-F. Regular Rolled Sections. Z. Wusatowski and R. Wusatowski. *Iron & Steel,* v. 29, Jan. 1956, p. 27-32. (Condensed from *Metallurgie und Giessereitechnik,* v. 4, July 1954, p. 295.)

Mathematical treatment of the problem of accurate roll design, using constancy of volume as a basis for the calculations. Diagrams, tables, graphs. 6 ref. (F23, ST)

61-F. Designing Aluminum Forgings. A. E. Favre. *Machine Design,* v. 28, Jan. 26, 1956, p. 76-84.

Advances in process, press equipment and alloys discussed in relation to improvement in the tolerances available to the designer. Diagrams, graphs, photographs, tables. (F22, A1)

62-F. Induction Heating for Forging. D. Warburton Brown. *Mechanical World and Engineering Record,* v. 136, Jan. 1956, p. 32-34.

Provides an accurate control of the applied heat and of metallurgical conditions in automatic forging plants. Photographs. (F22, J2)

63-F. (English.) **Investigation of the Influence of Different Factors on Roll Pressure, Energy Consumption, Spread and Forward Slip in Hot Rolling.** Gunnar Wallquist. *Jernkontorets annaler,* v. 139, no. 12, 1955, p. 923-1030.

Effects of composition, temperature and thickness on roll pressure power consumption, spread and slip for 16 steels studied in experimental mill. (F23, ST)

G
Secondary Mechanical Working

61-G. Machining Thin Sections. *Aircraft Production,* v. 17, Dec. 1955, p. 472-476.

Machining large-diameter thin-section parts of less than 0.20 in. thickness presents a number of difficulties. Of these, the gradual build-up of vibration by resonance and deformation of the part by spinning-over of the material are the most important. The most successful approach as yet employed for this class of operation is the balanced-cut double-sided turning technique, where the tools are traversed across the surfaces simultaneously. Photographs, diagrams. (G17, SS)

62-G. Automation Applied to Sheet Metal Blanking. Joseph F. Lyden. *Automation,* v. 3, Jan. 1956, p. 34-37.

An economic comparison case study using coil stock as opposed to cut sheet stock. Diagrams, photographs, tables. (G2, A4, ST)

63-G. Ultrasonic Machining of Brittle Materials. Maurice S. Hartley. *Electronics,* v. 29, Jan. 1956, p. 132-135.

Slicing germanium, silicon, quartz, ferrites, glass-bonded mica and other material at high speed by impact grinding results in greater precision and makes possible a great variety of shapes. Photographs, diagrams, table. (G18)

64-G. So You're Going to Buy a Press? M. D. Verson. *Iron Age,* v. 176, Dec. 22, 1955, p. 71-73.

Tips on hydraulic and mechanical presses, rated capacities, speeds, adjustment and safety features, lubrication systems. (G1)

65-G. Screw Machine Attachment Rolls Accurate Threads. W. G. Patton. *Iron Age,* v. 176, Dec. 22, 1955, p. 74-75.

A new type of thread rolling attachment on six-station automatic bar machines aids rocker arm valve stud production and assures accuracy of threads within 0.0005 in. Diagrams, photograph. (G12)

66-G. Technique for Machining Tungsten. *Machinery (London),* v. 87, Dec. 9, 1955, p. 1358-1360.

Copper is infiltrated into the porous matrix and removed by evaporation after the metal cutting operations. Photograph, micrograph. (G17, W)

67-G. Recommended Practices for Uranium Finishing. William B. Harris. *New York Operations Office (U. S. Atomic Energy Commission),* NYO-1516, May 1955, 13 p.

Specific machining practices, consistent with the maintenance of acceptable levels of airborne uranium, include the various tools for each type of machining job with recommended tool speeds, coolant flows, ventilation requirements. Diagram. (G17, F29, U)

68-G. (Czech.) **Lathes for Milling Gears With Spiral Teeth.** L. Lichnovsky. *Strojirenska vyroba,* v. 3, no. 10, Oct. 1955, p. 405-408.

Recommended feed rates and angles. Table, diagrams, photographs. (G17, ST)

69-G. (Czech.) **Cold Punching of Aluminum.** J. Odehnal and K. Marvan. *Strojirenska vyroba,* v. 3, no. 10, Oct. 1955, p. 413-417.

Detailed description of inverted punching operations. Diagrams, tables. (G2, A1)

70-G. (Czech.) **Mechanical-Chemical Lapping.** J. Ricka. *Strojirenstvi,* v. 5, no. 9, Sept. 1955, p. 682-684.

Chemical effects acting on surfaces being machine-finished. Comparison of usual superfinish with mechanical-chemical lapping and advantages of the latter. Tables, graphs, diagram. 8 ref. (G19)

71-G. (French.) **The Plastic Deformation Mechanism on Metal Cutting Operations and Resulting Deformations.** Paul Bastien and Michel Weisz. *Revue de métallurgie,* v. 52, no. 11, Nov. 1955, p. 837-863.

Current literature critically reviewed. Study is based on experimental examination of oriented crystal structure of chips. Results are related to shearing and chip friction angles and rake. Graphs, diagrams, photographs, micrographs, tables. 20 ref. (G17, Q24)

72-G. (French.) Belgian Research on Machinability of Metals. H. Herbiet and L. Czaplicki. *Revue universelle des mines,* v. 11, ser. 9, no. 11, Nov. 1955, p. 544-558.

Results of research on the development of special test equipment; determination of machinability of certain Belgium steel and a comparison with American steel of the same type. Determination of differences in machinability of steels to improve quality of Belgium steels. Tables, diagrams, photographs, micrographs. (G17, ST)

73-G. (French.) Contribution to the Analytical Study of Efficiency of Lubricants Used in Metal Machining. F. Eugene. *Revue universelle des mines,* v. 11, ser. 9, no. 11, Nov. 1955, p. 582-594.

Comparison of conditions of dry and lubricated machining. Influence of lubricant on the temperature of cutting and on wear resistance of tools. Tables, graphs, micrographs. 5 ref. (G21, G17, ST)

74-G. (German.) Electro-Erosive Method of Metal Machining. H. Opitz. *Revue universelle des mines,* v. 11, ser. 9, no. 11, Nov. 1955, p. 562-568.

Short review of methods other than with machine tools. Conditions of operation, equipment, advantages and application of the electro-erosive method. Diagrams, table, photographs, micrographs. 4 ref. (G17)

75-G. (Russian.) Drawing of Heat-Resistant Alloy With High-Pressure Jet Cooling Liquid. N. F. Pronkin. *Stanki i instrument,* v. 26, no. 11, Nov. 1955, p. 26-27.

Die cooling system, using a 10% emulsion with 2% of sulfo-"fresol" with jet aperture of 1-mm. and pressure of 25 kg. per sq.cm., doubles life of dies. Graphs, diagrams. (G21, G4, SG-h)

76-G. Short Run Specialists in Metal Stamping. V. W. Danielson. *Finish,* v. 13, Jan. 1956, p. 94-96.

Methods of operation and tooling ingenuity used for "nuisance" stamping jobs. Photographs. (G3, ST, Al, Cu)

77-G. 'Diamond Substitutes' in the Soviet Union. W. G. Cass. *Industrial Diamond Review,* v. 15, Dec. 1955, p. 226-227.

Lack of diamonds, necessary for precision, initiates investigation of nondiamond truing of grinding wheels in Soviet Union. Tables. 2 ref. (G18, C-n)

78-G. Diamond Tools for Producing Sheetmetal Dies. K. Sterl. *Industrial Diamond Review,* v. 15, Dec. 1955, p. 232-234.

Diamond-impregnated tools now make possible satisfactory machining of hardened steel. Diamond lapping pastes can be used for quick surface corrections. Photographs, tables. (G18, G19, ST)

79-G. How Does a Contract Stamper Choose a Press? C. C. Caditz. *Iron Age,* v. 177, Jan. 19, 1956, p. 67-69.

Characteristics of this branch of stamping industry; evaluates press versatility, auxiliary equipment, sturdiness vs. speed, replacement formulas. Photograph. (G3)

80-G. The Increasing Use of Abrasive Cutting. E. J. DeWitt. *Machinery (London),* v. 88, Jan. 6, 1956, p. 22-23.

Clean, accurate, economic cutting by the latest abrasive wheels and cutting-off machines. Photographs. (G17, G18)

81-G. Sheet-Metal Fabrication in Britain. Tom Bishop. *Metal Progress,* v. 69, Jan. 1956, p. 73-77.

Some aspects of industrial practices, especially finishing operations. Stiff, high-temperature alloys are successfully formed with a soft metal punch which itself deforms into the shape best adapted to each intermediate stage. Diagram, photographs. (G1, Al, Ni)

82-G. Heat Treatment of Steel for Good Machinability. H. Opitz, S. Ammareller and H. Koelzer. *Metal Progress,* v. 69, Jan. 1956, p. 108-114.

Suitable heat treatments for minimizing cratering and giving smooth surface finish; machinability in relation to shear strength. Diagrams, graphs, micrographs. (G17, J general, ST)

83-G. Some Overseas Developments in Surface Finish. C. A. Gladman. *Microtecnic (English Ed.),* v. 9, no. 5, 1955, p. 229-244.

Effect of surface finish on functions of engineering products and factors affecting finish in machining. 58 ref. (G17, G18, G19)

84-G. High Frequency Electro-Spark Machining of Hard Metals. *Microtecnic (English Ed.),* v. 9, no. 5, 1955, p. 267-271.

Revolutionary machining method improves present techniques and enables use of previously unmachinable alloys. Diagrams, photographs. (G17)

85-G. Machining Work-Hardened Alloy Steels. W. M. Halliday. *Tooling and Production,* v. 21, Jan. 1956, p. 64-66, 108, 110.

Some common causes of work hardening, with emphasis on the practical measures to be followed in the machine shop for correcting the condition during the machining of stainless steel parts so that their completion may be simplified and facilitated. Photographs. (G17, SS, AY)

86-G. (French.) Some Physical-Chemical Aspects of Oxygen Cutting. Claude Decroly and Guy Genin. *Revue de la soudure (Brussels),* v. 11, no. 4, 1955, p. 214-225.

Introduction and theoretical considerations, study of combustion of soft steel in oxygen. Graphs, diagrams, tables. (To be continued.) (G22, CN)

87-G. (German.) Comparative Studies on the Qualification of Single and Multi-Jet Blowpipes for Heating in Hot Forming. K. Boeckhaus and H. Ehrenberg. *Schweissen und Schneiden,* v. 7, no. 12, Dec. 1955, p. 488-495.

Effect of heat on transition temperature; resistance to plastic deformation and structure of carbon steels. Equipment and its selection. Photographs, graphs, tables. 8 ref. (G general, Q24, CN)

88-G. Machinability Testing-Relation Between Cutting Temperature and Tool Life for Gray Irons. E. A. Loria and D. R. Walker. *American Foundrymen's Society, Transactions,* v. 61, 1955, p. 261-263; disc., p. 264-266.

Lower cutting forces and temperatures lengthen tool life. Photographs, micrographs, graphs, tables. 4 ref. (G17, CI)

89-G. Learn Tricks of Bending Wrought Iron Pipe. A. C. Curran. *Canadian Power Engineer,* v. 16, Nov.-Dec. 1955, p. 34-36.

Proper method of pipe bending. Diagrams, photograph, table. (G6, Fe)

90-G. Causes and Control of Distortion During Machining of Aluminum Alloy Forgings. Loyl R. Thomas and Harry J. Gilliland. *General Motors Engineering Journal,* v. 3, Jan.-Feb. 1956, p. 28-33.

Experiments led to reduced distortion, elimination of several laborious operations, saving in time and money. Photographs, diagrams, tables. (G17, Al)

91-G. How to Design for Top Fabricating Economy. *Iron Age,* v. 177, Jan. 26, 1956, p. 78-81.

Physical properties of raw materials, fabrication methods and design given as essential elements of economical fabrication. Diagram, photographs. (G general)

92-G. Permanent Dies Pare Hammer Stamping Costs. *Iron Age,* v. 177, Jan. 26, 1956, p. 82.

For producing hammer stampings in limited quantities, lead-Kirksite dies are among the most practical low-cost tools available; for longer runs, lead-Meehanite tooling has resulted in a cost saving. Photograph. (G3)

93-G. Applications of Thread and Form Rolling. C. T. Appleton. *Machine Design,* v. 28, Jan. 26, 1956, p. 101-104.

Advantages of rolled threads compared with common thread finishes. Diagrams, photographs, tables. (G12)

94-G. Powder Cutting. E. T. Casey. *Metal Industry,* v. 88, Jan. 13, 1956, p. 23-27.

Equipment and procedures for cutting alloys steels and nonferrous metals, using finely divided iron powder added to reaction zone to assist oxygen cutting reaction. Photographs, diagrams, table. 1 ref. (G22, SS, AY, Ni, Cu, Al, Zn)

95-G. Complementary Economies in Blanking From Cut Sheet. *Mechanical World and Engineering Record,* v. 136, Jan. 1956, p. 26-28.

Design of dies and tools, procedures for removing the blanks, determination of blanking pressure. Diagrams, table. (G2)

96-G. Coated Abrasive Finishing. C. Perrett. *Metal Industry,* v. 88, Jan. 13, 1956, p. 28-31.

Development of belt grinding machines for foundry use and the three categories into which they have been split, according to the part of belt used. Photographs, diagrams, graph. (G18, E general)

97-G. Applying Carbides to Bar Skimming. Ugo Wegner and Hans Lindemann. *Metalworking Production,* v. 99, Dec. 30, 1955, p. 2209-2214.

Problems involved and how they were overcome. Diagrams, photographs. (G17)

98-G. The Precision Touch in Grinding. Mike Curtis. *Steel,* v. 138, Jan. 23, 1956, p. 70-71.

Strict adherence to set of rules in roller bearing plant results in increased accuracy and quality of product. Photographs. (G18)

99-G. A Look at Numerical Control for Machine Tools. R. Lowell Hand. *Western Machinery and Steel World,* v. 47, Jan. 1956, p. 74-78.

Numerical concept of recording information for tape control of machine tools; methods used in machining of skins for aircraft wings; future aims for improving production operation by utilizing numerical control methods. Photographs, diagrams, table. (G17, Al)

100-G. (Book.) Die Design Handbook. Frank W. Wilson, Ed. McGraw-Hill Handbook. 694 p. 1955. McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 36, N. Y.

Reference book containing practical information on product design, metal movements, process analysis, materials, and proved die designs for every class of sheet-metal press-working. (G1)

H

Powder Metallurgy

30-H. (Czech.) **Improving the Quality of Sintered Carbides.** B. Cech. *Strojirnstvi*, v. 5, no. 11, Nov. 1955, p. 841-844.

Cutting tool strength and endurance and their effects on cutting operations. Effect of composition and manufacturing methods on quality. Graph, diagrams. 7 ref. (H general, G17, C-n)

31-H. (French.) **Possibility and Limits of Powder Metallurgy.** Michel Zeicher. *Revue universelle des mines*, v. 11, ser. 9, no. 11, Nov. 1955, p. 594-605.

Production methods and application of metals with high melting points; metal, metal-ceramic and porous compounds; semiconductors and pseudo-alloys of metals and metalloids. Future of powder metallurgy. Photographs, diagrams. 36 ref. (H general)

32-H. (Russian.) **Some Physico-Chemical Properties of Titanium Boride and Nitride Alloys.** G. V. Samsonov and E. V. Petrash. *Metallovedenie i obrabotka metallov*, no. 4, Oct., 1955, p. 19-24.

Compositions, melting temperatures, microhardness, thermal coefficient of linear expansion, lattice period, electrical resistance, microstructure, resistance to oxidation. Graphs, tables, diagram. 10 ref. (H general, P general, Ti, B)

33-H. Manufacture of Electric Contact Alloys and Sintered Iron Bearings. E. E. Rooste. *Australasian Engineer*, 1955, Nov., p. 53-55.

Manufacture of tungsten-copper and molybdenum-silver alloys as typical examples of the infiltration technique for the manufacture of contact alloys. Graphs, micrographs, photographs, table. (H16, SG-c, r, Fe)

34-H. Powder Metal Bushes. J. B. Mohler. *Metal Industry*, v. 88, Jan. 6, 1956, p. 3-6.

Use of powdered metal for bushings has proven very effective. Speed and load capacity are tested. Tables, photographs, graphs, diagram. (H general, T7, Fe, Cu)

35-H. Powder Metallurgy in Japan. Takashi Kimura and Henry H. Hausner. *Metal Progress*, v. 69, Jan. 1956, p. 61-64.

Review of two decades of work with superior magnetic materials in Japanese industry. Carbide tools, porous bearings, electrical contacts are now produced in volume. Tables. (H general)

36-H. Preparation and Sintering of Molybdenum Silicide. W. Rutkowski. *Henry Brutcher Translation No.* 3593, 6 p. (Abridged from *Biuletyn informacyjny*, v. 6, no. 1, 1955, p. 1-3.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 125-H, 1955. (H15, Mo)

37-H. (German.) **Development and Position of Sintered Aluminum.** Alfred von Zeerleder. *Zeitschrift für Metallkunde*, v. 46, no. 11, Nov. 1955, p. 809-812.

Production methods, comparison with other metals, applications, physical properties. Tables, graphs, diagram, photograph, micrographs. (H general, Al)

38-H. (German.) **Behavior of Spheroidal Metal Powder During Pressing and Sintering.** Erich Pelzel. *Zeitschrift für Metallkunde*, v. 46, no. 11, Nov. 1955, p. 813-817.

Calculation of the contact surfaces under increasing compression of spheroidal-metal powder. Relation between porosity and the sum of contact surfaces. Micrograph, tables, graphs, diagrams. (H14, H15)

39-H. The Powder Metallurgy of Uranium. H. H. Hausner and J. L. Zambrow. *Sylvania Electric Products, Inc. (U. S. Atomic Energy Commission)*, AECD-3665, May 1955, 18 p.

Characteristics of uranium hydride, factors controlling the rate of the hydride formation, sintering, pressing and re-pressing of uranium powder compacts. Graphs, micrographs, photograph. (H general, U)

J

Heat Treatment

56-J. Atmosphere Controls Boost Heat Treat Output. T. N. Duncan. *Iron Age*, v. 176, Dec. 22, 1955, p. 76-78.

Batch-type furnaces with automatic atmosphere and temperature controls give fewer rejects, better control and doubled production. Diagram, photographs. (J2, ST)

57-J. Heat Treating to Produce Pearlitic Malleable. James H. Lansing. *Steel*, v. 137, Dec. 26, 1955, p. 60-62.

Procedure used in producing pearlitic malleable castings; their properties and applications. Micrographs, table, photographs. (J23, CI)

58-J. Towering Mobile Furnace West's First to Treat 16-Ft. Parts. *Western Metals*, v. 13, Dec. 1955, p. 48-49.

Design and construction of a bottom-loading, bottom-quenching mobile furnace with three-zone temperature control which will enable both fabrication and heat treatment of many aircraft, oil tool, ordnance and automotive parts. Photographs. (J general)

59-J. (Czech.) **Defects During Heat Treatment in Protective Atmospheres.** J. Domorazek. *Strojirenstvi*, v. 5, no. 9, Sept. 1955, p. 693-700.

Classification of protective atmospheres, exothermic and endothermic methods of preparing them. Effects of individual components of atmospheres on steel. Determination of carbon potential. Cause and elimination of defects. Graphs, diagrams. 8 ref. (J2, J general, ST)

60-J. (Russian.) **Rational and Economical Regimes for Annealing Die Blanks of Steel 5KhNT.** N. A. Timchenko. *Metallovedenie i obrabotka metallov*, no. 4, Oct. 1955, p. 32-38.

Recommended cooling and heating periods in annealing furnaces and their relations to hardness. Kinetics of isothermal austenitic transformation. Cooling conditions of surface and interior zones of blanks. Graphs, tables, micrographs. 2 ref. (J23, N8, Q29, TS)

61-J. Residual Stresses and Stress Relieving. R. Weck. *British Welding Journal*, v. 3, Jan. 1956, p. 19-21.

Summary of findings on various aspects of stress and stress relief. Stress relief unnecessary above transition temperature, is, as yet, undetermined. 3 ref. (J1, Q25, ST)

62-J. Heat Treatment Improves Plating on Zinc Die Castings. W. G. Stephenson, Jr. *Products Finishing*, v. 20, Jan. 1956, p. 28-30, 32, 34.

Common defects involved in plate finishing and a new technique to avoid such defects. Micrographs. (J23, L17, Zn)

63-J. A New Method for the Evaluation of High-Vacuum Furnaces and Heat-Treating Atmospheres. W. R. McMillan and Earl A. Gulbransen. Paper from "Vacuum Metallurgy". Electro-Chemical Society, Inc., p. 72-85.

Oxidation studies made on Armco and Puron grades of iron in high vacuum of 10^{-3} mm. of mercury and in oxygen atmospheres of 1×10^{-5} mm. of mercury. Diagram, table, micrographs. 11 ref. (J general, R2, Fe)

64-J. Vacuum Heat-Treating Techniques. Richard L. Hoff and A. M. Bounds. Paper from "Vacuum Metallurgy". Electrochemical Society, Inc., p. 128-141.

Equipment and procedures, future applications, advantages and disadvantages. Photographs, tables, graphs. 8 ref. (J general, Mn, Cu, Cr, Ni, Fe, Ti, Zr)

65-J. Vacuum Annealing of Steel Bars. O. Felgel-Farnholz, H. Sidan, and W. H. Scheibe. *Henry Brutcher Translation No.* 3600, 21 p. (From *Berg- und Hüttenmännische Monatshefte*, v. 100, nos. 7-8, 1955, p. 250-257.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 251-J, 1955. (J23, ST)

66-J. Hardenability of Ductile Cast Iron. C. C. Reynolds, W. T. Whittington and H. F. Taylor. *American Foundrymen's Society, Transactions*, v. 63, 1955, p. 116-122.

Method for calculating hardenability from chemical composition. Comparisons of the hardenabilities of ductile iron and steel. Relationship between hardenability, section and severity of quench. Graphs, tables, micrographs. 2 ref. (J26, CI)

67-J. Effects of Trace Amounts of Tin, Lead and Antimony on Annealing of Blackheart Malleable Iron. R. C. Shnay, J. E. Wilson and J. E. Rehder. *American Foundrymen's Society, Transactions*, v. 63, 1955, p. 457-465; disc., p. 465.

Lead, tin or antimony have no appreciable effect on first-stage annealing. Tin and antimony act on the rate of second-stage annealing. Micrographs, graphs, tables. 11 ref. (J23, Fe)

68-J. Continuous Heat Treating for Automatic Production. W. J. Behrens. *Industrial Gas*, v. 34, Jan. 1956, p. 17-19, 23-24.

Production rates are decreased, excess handling is eliminated, and closer control of processing made possible. Diagrams, photographs. (J general)

69-J. Induction Hardening. I. D. Warburton Brown. *Machinery Lloyd (Overseas Ed.)*, v. 28, Jan. 7, 1956, p. 71-74.

Practical aspects of application of induction heating to hardening problems, equipment, case depth and frequency, power requirements and advantages. Graphs. (J2, ST)

70-J. Heat Treating Steel Castings. Clyde B. Jenni. *Steel*, v. 138, Jan. 23, 1956, p. 84-86, 88.

Heat treatment, along with control of chemical compositions, can be utilized to produce steel castings with desired combination of mechanical properties. Photograph, micrographs, graph, table. (J general, Q general, ST)

71-J. The Development of the Nitriding Process—A Critical Appraisal. G. J. Cox. *Wild-Barfield Heat Treatment Journal*, v. 5, Dec. 1955, p. 2-5.

History of the treatment and some interesting theories. Photographs. 30 ref. (J28)

K

Joining

91-K. Automatic Pressure Butt-Welding Process for High Pressure Pipe Lines. *Engineer,* v. 200, Dec. 23, 1955, p. 913-914.

A gas welding process in which the desired pressure is developed automatically by making use of the plasticity of the steel that is being welded to control the welding cycle. Diagram, micrograph, photographs. (K2, AY)

92-K. The Significance of Contact Angle Measurements in Soldering. N. R. Srinivasan and H. S. Aswath. *Indian Institute of Science, Journal,* v. 37, sec. B, Oct. 1955, p. 293-303.

A critical review of contact angles in soldering, spreading power of a solder over a metallic surface and various fluxes used. Diagram, tables. 44 ref. (K7, SG-f)

93-K. How to Get Better Welds in a Weldable Steel. H. S. Davis. *Iron Age,* v. 177, Jan 19, 1956, p. 70-71.

Methods of welding Carilloy, low-carbon quenched and tempered constructional alloy plate steel. Tests show that welding does not affect tensile properties, improves hardness and toughness. Photographs. (K1, Q general, AY)

94-K. New Flux Simplifies Brazing of Chrome Carbide. *Iron Age,* v. 176, Dec. 22, 1955, p.82.

Brazing of sintered chromium carbide in air, without special equipment, is now economically practicable with a flux containing powdered boron. Photograph. (K8, Cr)

95-K. New Adhesives for Metal Structures. George J. Baumbach, Jr. *Sperry Engineering Review,* v. 8, Nov.-Dec. 1955, p. 17-21.

Use and bonding properties of new adhesives; their industrial potential in the metal structures field. Diagram, tables. 4 ref. (K12)

96-K. (Czech.) Introduction to Automatic Welding Under Flux. J. Lukasek. *Strojirenska vyroba,* v. 3, no. 10, Oct. 1955, p. 395-401.

Comparison of various operational techniques, types of welds possible, descriptions of automatic welding machines used. Photographs, tables, diagrams. (K1)

97-K. (Czech.) Full Utilization of Welding Technology. R. Krnak. *Strojirenska vyroba,* v. 3, no. 10, Oct. 1955, p. 401-404.

Situations where welded parts can be used instead of cast parts. Comparative cost figures. Graphs, tables, photographs, diagrams. 4 ref. (K general, CI, ST)

98-K. (Russian.) Selection of Basic Parameters of Apparatuses for Condenser Butt Welding. N. S. Siunov and M. A. Sergeev. *Svarochnoe proizvodstvo,* no. 12, Dec. 1955, p. 4-6.

Voltage, current, gap, boiling temperature of metal, and other factors are calculated for welding wires of high heat resistant alloys. Circuit diagram, diagram. 3 ref. (K1, SG-h)

99-K. (Russian.) Use of Contact Machines, Types MTP and MShP, for Welding Light Alloys. D. S. Balkovets and P. L. Chuloshnikov. *Svarochnoe proizvadstvo,* no. 12, Dec. 1955, p. 19-21.

Description of functioning of primary winding and volt-supplementing transformer. Capabilities of these machines for spot welding of sheets. Table, diagrams. (K3, EG-a)

100-K. (Russian.) Adhesion of Metals During Local Plastic Deformation. S. G. Aibinder and E. F. Klokova. *Zhurnal tekhnicheskoi fiziki,* v. 25, no. 13, Nov. 1955, p. 2356-2364.

Adhesion between two smooth metal surfaces is caused by interatomic forces, but its development is affected by the surface film deformation and mechanical properties of the film and base metal. Tables, micrographs. 10 ref. (K12, Q24)

101-K. (Spanish.) Argon Arc Welding. Alfredo Sarria. *Ciencia y técnica de la soldadura,* v. 5, no. 26, Sept.-Oct. 1955, 10p.

Various methods; advantages and disadvantages of each. Tables, photographs, diagram. (K1)

102-K. (Spanish.) The Development of Some Special Welding Processes. W. Hofmann. *Ciencia y técnica de la soldadura,* v. 5, no. 26, Sept.-Oct. 1955, 6 p.

Recent results from cold pressure welding on steel, diffusion bonding, welding of pins and flow welding. Diagrams, graphs, photograph, micrographs. (K5, K6, ST)

103-K. (Spanish.) Joining of Aluminum Cables With Steel Core by an Aluminothermal Process. R. Mearin Domezain. *Ciencia y técnica de la soldadura,* v. 5, no. 26, Sept.-Oct. 1955, 5 p.

Process of welding aluminum cables by electrical conduction. Diagram, photographs. (K3, Al)

104-K. Progress in the Use of Welded Steel Structures. J. W. Roderick. *Australasian Engineer,* 1955, Nov., p. 48-52.

Progress that has been made in the methods, procedures and overall efficiency of welded steel structures. Diagrams, table, photographs. (To be continued.) (K1, T26, AY)

105-K. An All-Welded Aluminium High-Speed Motor Launch. R. C. Du Cane. *British Welding Journal,* v. 3, Jan. 1956, p. 1-9.

Application of certain welding processes to construction of light-alloy marine craft. Describes experimental work, construction, various problems encountered. Process offers saving in man-hours and opportunity for prefabrication. Diagrams, photographs, table. (K general, Al)

106-K. Resistance Welding and Post-Heat-Treatment of Steel Stud Projection Welds. E. V. Beatson, E. Mitchell and L. N. Sayer. *British Welding Journal,* v. 3, Jan. 1956, p. 10-19.

Technique for temperature measurement of heat affected zone permits quick determination of satisfactory post-heat treatments for medium-carbon steels, thus extending range of weldable steels. Tempering treatment used to improve joint properties of low-carbon steels. Effect of welding and post-heating on transformation characteristics. Diagrams, graphs, micrographs, tables. 4 ref. (K3, K9, N8, J1, ST)

107-K. Welding in the Shipbuilding Industry. R. J. W. Rudkin. *British Welding Journal,* v. 3, Jan. 1956, p. 22-24.

Research on butt-welding processes, fillet welding by visible-arc machines and the brittle fracture problem is urgently needed. Labor scarcity, need for modernization, fatigue failure present further problems. (K1, Q26)

108-K. Projection Welding in the Clutch. Charles Berka. *Industry & Welding,* v. 29, Jan. 1956, p. 50-52, 55.

Projection welding is performed on a press-type combination projection and spot welder. The resulting clutch assembly is clean, free from spatter, has high strength. Photographs. (K3)

109-K. How Circuit Revisions Improve Automatic Arc Welds. W. F. Williams. *Industry & Welding,* v. 29, Jan. 1956, p. 58-60, 63-66.

Operation of an automatic welding machine; circuit changes to improve weld quality. Graphs, diagram. (K1)

110-K. "Inside-Out" Bronze Brazing Makes Strong Structural Joints. *Industry & Welding,* v. 29, Jan. 1956, p. 70-72.

Method utilizes bronze beads for filler metal and applies a brazing alloy from the inside. Multiple-tip torches with flux-bearing flames provide rapid even heat and assure application of the proper amount of flux. Photographs. (K8)

111-K. Ceramic Brazing Jigs Cut Cycle Time, Raise Output. Herbert Schwartz. *Iron Age,* v. 177, Jan. 12, 1956, p. 71-73.

Advantages and disadvantages of brazing as a joining method for various materials. Graph, photograph, table. (K8)

112-K. Good Handling Steps Up Brazing Furnace Output. D. W. Owen. *Iron Age,* v. 177, Jan. 19, 1956, p. 78-79.

Partially automatic system for production of aluminum refrigerator parts. Particular features are close temperature and atmosphere control, automatic welding, safety platforms for loading. Photographs. (K8, A5, Al)

113-K. Argon-Arc Welding Offers Opportunities. T. E. W. Preston. *Metalworking Production,* v. 100, Jan. 6, 1956, p. 1-8.

British practice in use of one-side argon-arc spot welding, a development of the inert-gas shielded tungsten-arc processes. Photographs, diagrams, tables, graphs. (K1, K3)

114-K. Consumable Insert Technique for Pipe Welding. R. D. Thomas Jr. *Pipe Line News,* v. 28, Jan. 1956, p. 28-31.

New method for root-pass welding provides reliable piping for atomic installations without requiring highly skilled operators, internal gas-pressure control or rigid fit-up tolerances. Diagrams, photographs, tables, micrographs. 6 ref. (K1)

115-K. High-Strength Cast Steel With Good Welding Properties. I. R. Kryanin. *Henry Brutcher Translation No.* 3605, 7 p. (From *Svarochnoe proizvodstvo,* 1955, no. 7, p. 7-9.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 361-K, 1955. (K9, M27, J general, Q23, Q29, CI)

116-K. (Dutch.) The Welding of Very Large High-Pressure Tanks. C. J. Verzijlbergh. *Smit mededelingen,* v. 10, no. 3a, Dec. 1955, p. 102-105.

Use of closed joint design in the U.M. ("Unionmelt") welding of extraction towers made of 75-mm. plates. Graph, diagram, photographs. (K1, ST)

117-K. (Dutch.) The U.M. ("Unionmelt") Welding of Thick Plates. G. Westendorp. *Smit mededelingen,* v. 10, no. 3a, Dec. 1955, p. 115-121.

Concludes that heavily stressed structures, over 50 mm. thick, must be welded by the multipass method. Tables, graphs, diagrams, photographs. (K1, ST)

118-K. (Dutch.) Welding With Smit-Welding Tape. P. G. Weeber. *Smit mededelingen,* v. 10, no. 3a, Dec. 1955, p. 122-124.

Advantages and use of Smit-weld-

ing tape on open joints. Tables, diagrams, photographs. (K1)

119-K. (Dutch.) **"Sigma" (Shielded Inert-Gas Metal-Arc) Welding of Nonferrous Metals.** P. J. Verlee. *Smit mededelingen,* v. 10, no. 3a, Dec. 1955, p. 132-136.

Argon-arc and "sigma" welding compared in nonferrous metals; future developments considered. Examples of "Sigma" welding. Table, graph, diagrams, photographs. (K1)

120-K. (Dutch.) **Annealing of Weld Seams.** J. J. M. Roos. *Smit mededelingen,* v. 10, no. 4, Oct.-Dec. 1955, p. 146-157.

Examples of indirect resistance and induction heating. Diagrams, photographs. (K3, J23)

121-K. (French.) **Welded Gates of Movable River Dams. Design and Execution.** G. Willems. *Revue de la soudure (Brussels),* v. 11, no. 4, 1955, p. 175-190.

Advantages of welding in the construction of dam gates, making possible light, simple, inexpensive frames little affected by vibrations. Maps, diagrams, photographs. (K general)

122-K. (French.) **Welding in the Construction of Steam Turbines and in the Electrical Equipment of Heating Plants.** Ch. Forcinal. *Soudage et techniques connexes,* v. 9, nos. 11-12, Nov.-Dec. 1955, p. 281-294; disc., p. 294-296.

Different welding processes in the construction of steam turbines, alternators, transformers, high-voltage circuit breakers. Photographs, diagrams. (K general, T25, T1)

123-K. (French.) **Metallurgical Problems During the Electric Arc Welding of Steels for Turbine Wheels.** Stig-Erik Erikson. *Soudage et techniques connexes,* v. 9, nos. 11-12, Nov.-Dec. 1955, p. 297-310.

New method of examining the weldability of turbines, based on heating by high-frequency current. Diagrams, graphs, tables, micrographs. 10 ref. (K1, K9, ST)

124-K. (French.) **Some Applications of Welding to the Maintenance and Repair in Electric Power Plants.** G. M. A. Blanc. *Soudage et techniques connexes,* v. 9, nos. 11-12, Nov.-Dec. 1955, p. 312-318.

Welding of turbines, alternators, Pelton wheels, diesel engines, turbo-alternators. Table, diagrams, micrographs, photographs. (K general, T25)

125-K. (French.) **High-Strength Weldable Steels.** Lachenaud. *Technique et science aéronautiques,* 1955, no. 5, p. 314-320.

Four types of chromium-molybdenum steels, from point of view of metallurgy and blow-torch and arc welding, for use in airframe construction Table, graphs, diagrams. (K1, K2, AY)

126-K. (German.) **Contemporary State of Electrical Resistance Welding. II.** Walter Brunst. *Elektrotechnische Zeitschrift,* v. 7, Ausgabe B, no. 12, Dec. 1955, p. 442-448.

Principles of various types using induction contact electrodes. Table, graphs, diagram, photographs, micrographs. 10 ref. (K3)

127-K. (German.) **Fundamentals of Welding Non-Ferrous Heavy Metals and Their Alloys in Industrial Finishing.** E. Klosse. *Metall,* v. 9, nos. 23-24, Dec. 1955, p. 1086-1087.

Applications to pure copper, nickel, zinc and lead, and their various alloys, in addition to galvanized steel sheet and silver. (K general, Cu, Ni, Zn, ST, Pb, Ag)

128-K. (German.) **Behavior of Welded Joints Between Rolled Steel and Cast Steel Under Pulsating Tensile Stress.** K. Wellinger and P. Gimmel. *Schweissen und Schneiden,* v. 7, no. 12, Dec. 1955, p. 496-503.

Type and shape of the test samples and the welded spots; hardness test on welded seams; structure of the fractured surface. Tables, graphs, diagram, photographs. 5 ref. (K9, Q27, M27, CI, ST)

129-K. Researches Into the Welding of Aluminum and Its Alloys. W. F. Pumphrey. *Aluminum Development Association, Research Report No.* 27, July 1955, 59 p.

Investigates problems of cracking above and below solidus, factors affecting quality of argon-arc welds, thermal effects of welding and the development of alloys with good welding and mechanical properties. Diagrams, graphs, micrographs, photographs, table. (K1, K2, Q general, Al)

130-K. Steel Castings. Their Engineering Advantages in Weldments. E. J. Wellauer. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 569-574.

Steel castings in weldments increase product value because simplified manufacturing and inspection techniques can be used. Photographs, graphs. 11 ref. (K general, ST)

131-K. 'Thermal Barrier' Puts Emphasis on Precision Forming Techniques. George L. Christian. *Aviation Week,* v. 64, Jan. 30, 1956, p. 62-63, 65-66.

Welding techniques for fabricating high-strength steels and titanium alloys. Photographs. (K1, K3, AY, Ti)

132-K. Innovation in Soldering. *Chemical and Engineering News,* v. 34, Jan. 30, 1956, p. 498.

Good bond is obtained by first roughening surface to be soldered with a grinding wheel loaded with a soft solder. Ceramics and difficult metals have been joined by this method. (K7)

133-K. Torsion Bars Control Torque in Nut Running Tools. *Iron Age,* v. 177, Jan. 26, 1956, p. 76-77.

High-speed nut running tools are now available which use adjustable torsion bars to hold torque within a 15% total variation from required mean figure. Photographs. (K13)

134-K. Shrink Fitting Gets a Boost. R. L. Henderson. *Steel,* v. 138, Jan. 30, 1956, p. 88-89.

Small oven with 12 1000-watt infra-red tubes quickly reaches high temperatures. Used to expand bearing assemblies and shrink fit gears quickly and efficiently. Photographs, graph. (K13)

135-K. The Welding of Clad Steels. J. Hinde. *Welding and Metal Fabrication,* v. 24, Jan. 1956, p. 11-15.

Choice of welding process, set-up and alignment procedures, downhand butt, vertical and overhead butt, fillet and other forms of welding. Diagrams, tables, graphs. (To be continued.) (K1, ST, SS, Ni)

136-K. (German.) **Regularities of Intergrowth Phenomena of Crystals. III. Theory of Press-Welding of Metal Bodies.** Friedrich Erdmann-Jesnitzer and Wolfgang Wichmann. *Zeitschrift für Metallkunde,* v. 46, no. 12, Dec. 1955, p. 854-859.

Tempering of cold compressed aluminum cylinders. Effect of surface preshaping on the solidifying temperature. Comparative observation of adhesion theory. Tables, graphs, photographs, micrographs. 20 ref. (K5, M26, Al)

L

Cleaning, Coating and Finishing

199-L. Alloy Plating Can Give Your Products New Appeal. F. A. Lowenheim and R. T. Gore. *Iron Age,* v. 176, Dec. 22, 1955, p. 67-70.

Plating of alloys is gaining importance because it offers unique combinations of properties and improved sales appeal of products with attractive new coatings. Photographs. (L17, Cu, Ni)

200-L. Tin Alloy Coatings. S. C. Britton. *Metal Industry,* v. 87, Dec. 16, 1955, p. 510-511.

Results of investigations into possible alternatives to decorative nickel-chromium finishes. Photographs. 5 ref. (L17, Ni, Cr, Sn)

201-L. Protective Coatings for Steels Used Up to 1000° F. *Metal-Working,* v. 12, Jan. 1956, p. 14-16.

Treatment employed in selecting the protective coating for a low-alloy steel part; applications and limitations of various coatings. Table, photographs. (L16, L17, L26, ST)

202-L. Science for the Coatings Technologist. II. Pigments: General Considerations; White Pigments. E. S. Beck. *Organic Finishing,* v. 16, Dec. 1955, p. 6, 8-14.

Scientific principles, explained in a simple manner, that are encountered in organic finishing practices. Photograph, table, micrographs, graphs. (To be continued.) (L26)

203-L. A Survey of Novelty Finishes. II. Harry Burrell. *Organic Finishing,* v. 16, Dec. 1955, p. 15-20.

Pebble, hammer and metallic finishes, veiling lacquers, spatters. Materials, preparation, application methods. Photographs, micrographs. (To be continued.) (L general)

204-L. An Evaluation of Organic Coatings for Use in Cathodically Protected Domestic Hot-Water Tanks. B. G. Brand, F. W. Fink, G. A. Hudson and E. R. Mueller. *Paint and Varnish Production,* v. 46, Jan. 1956, p. 25-32.

Organic coatings used on domestic hot-water tanks, protected with magnesium anodes, must have alkali resistance and water impermeability. Epoxy-phenolic resins appear to be the solution. Graphs, diagram, photograph, tables. 4 ref. (L26, R10)

205-L. Developments in Steel Containers Solve Shipping Problems. *Paint and Varnish Production,* v. 46, Jan. 1956, p. 33-35.

Construction, specifications, decorations and internal coatings on steel containers. Diagrams, photographs. (L26, ST)

206-L. Consistent Barrel Finishing Assured By File System. *Precision Metal Molding,* v. 14, Jan. 1956, p. 59-61.

A file system which greatly simplifies processing of many different parts in the manufacture of business machines and the versatility required to meet important conditions. Photographs. (L10)

207-L. Chromium Plating Rocket Motors. *Steel,* v. 138, Jan. 16, 1956, p. 74.

A method for plating chromium uniformly on the serrated interiors of hourglass-shaped rocket engines. Photograph. (L17, Cr)

208-L. Electrotinning Tightens Wire Coating Control. *Steel,* v. 138, Jan. 16, 1956, p. 90-91.

Advantages of electrotinning of copper wire and the method used to set up a wire electrotinning line. Micrograph, photograph, table. (L17, Sn, Cu)

209-L. (Czech.) Determination of the Effect of Inhibitors in Pickling Baths. J. Kolofik. *Hutnik*, v. 5, no. 10, Oct. 1955, p. 315-316.

Evolution of hydrogen during pickling, temperature of bath, amount of inhibitor. Table, graph, diagrams. (L12, ST)

210-L. (Czech.) Chemical Polishing of Metals. V. Dlouhy, *Strojirenstvi*, v. 5, no. 11, Nov. 1955, p. 837-841.

Advantages in polishing of copper, aluminum and their alloys. Precleaning procedures, regeneration of solutions, determination of degree of polish. Photographs, diagrams. 5 ref. (L12, Al, Cu)

211-L. (French.) Surface Treatment of Aluminum and Its Alloys. I. Mechanical Treatment. Mechanical Polishing. Charles Etienne and Francois Flusin. *Revue de l'aluminium*, v. 32, no. 225, Oct. 1955, p. 921-931.

Reviews buffing and polishing machines, types of polishing, polishing defects. Table, photographs, diagrams. (L10, Al)

212-L. (German.) Flame-Sprayed Light Metal Bearings. G. Vogelpohl, A. Matting and K. F. Hahn. *Aluminium*, v. 31, no. 11, Nov. 1955, p. 544-553.

Practical application of fused light metal spraying for plain bearing production. Photographs, graphs, tables, diagrams, micrographs. 21 ref. (L23, Al)

213-L. (German.) Cleaning of Metallic Surfaces by Shot Blasting. Otto Peltzer. *Stahl und Eisen*, v. 75, no. 25, Dec. 1955, p. 1681-1691.

History, theory of process, secondary effects, machines used, cleaning mediums, method of working. Diagrams, graph. 5 ref. (L10)

214-L. (German.) Cold Zinc—A New Remarkable Surface Protector. I. C. Fritz. *Werkstoffe und Korrosion*, v. 6, no. 11, Nov. 1955, p. 521-523.

Process and advantages of coating metals with zinc paste as a substitute for galvanic method. 12 ref. (L15, Zn)

215-L. (German.) Effect of Light on the Solubility of Copper in Electrolytes. T. Markovic and O. Jaric. *Werkstoffe und Korrosion*, v. 6, no. 11, Nov. 1955, p. 535-538.

Photo and electrochemical treatments of the problem. Graphs. 12 ref. (L17, Cu)

216-L. (Polish.) Determination of the Amount of Free Acid in Bath for Pickling Steel. Kazimierz Janas. *Wiadomosci hutnicze*, v. 11, no. 11, Nov. 1955, p. 347-349.

Study of chemical removal of oxides and scale provides data for nomogram to determine amounts of free H_2SO_4 and free HCl in pickling bath. Graph, nomograms. (L12, ST)

217-L. (Russian.) Destruction of Metal Surface in Relation to the Angle of Impact of Abrasive Particles. V. N. Kashcheev. *Zhurnal tekhnicheskoi fiziki*, v. 25, no. 13, Nov. 1955, p. 2365-2368.

Copper and aluminum bronzes were subjected to the abrasive action of corundum grains at different speeds and angles to determine conditions of maximum wear. Graphs, diagram. 6 ref. (L10, Q9, Cu)

218-L. Automatic Electrostatic Spraying. Gives Better Uniformity of Ground Coat. *Automotive Industries*, v. 114, Jan. 15, 1956, p. 65.

New automobile paint spraying process capable of applying two coats of uniform ground coating to 125 cars per hr. Photograph. (L26)

219-L. The Production of Glass-Lined Water Heaters. *Finish*, v. 13, Jan. 1956, p. 17R-20R.

Production methods and special equipment used. Photographs. (L27, ST)

220-L. Cleaning Stainless Steel—Easiest Method Is Best Metnod. Walter Kaiser and Richard E. Paret. *Food Processing*, v. 17, Jan. 1956, p. 24-25.

Tables of recommended cleansers and detergents, treatment of hard-to-clean deposits, corrosion inhibitors. Photographs, tables. (L10, L12, R10, SS)

221-L. Preparation and Properties of Polyurethane Coatings. Charles B. Reilly and Milton Orchin. *Industrial and Engineering Chemistry*, v. 48, Jan. 1956, p. 59-63.

Preliminary development and properties of a successful coating for high-speed aircraft in which the aluminum was protected against rain-erosion. Photograph, tables, graph. 6 ref. (L26, R4, Al)

222-L. Accelerated Tests for Mildew Resistance of Oil Paints. Robert M. Evans and Edward G. Bobalek. *Industrial and Engineering Chemistry*, v. 48, Jan. 1956, p. 122-125.

Accelerated tests compared with long-term service tests. Weathering is important before resistance measurement. Tables. 22 ref. (L26)

223-L. Metallizing Saves a Stainless Steel Shaft. *Industry & Welding*, v. 29, Jan. 1956, p. 74-76.

Process for metallizing a damaged shaft so that hardness and other properties of the repaired area are much beter than in the original material. Photographs. (L23, SS)

224-L. Aluminizing Curbs High Temperature Erosion. W. G. Patton. *Iron Age*, v. 177, Jan. 12, 1956, p. 74-77.

One of the first high-speed installations flame spraying corrosion-resistant aluminum on alloy steel engine valves. Photographs. (L23, Al)

225-L. Spray-Welded Alloy Overlay Triples Part Life. *Iron Age*, v. 177, Jan. 12, 1956, p. 83.

Coating that portion of a rod where critical abrasive conditions are encountered has given tripled service life to the rod. Photograph. (L23)

226-L. New Building Trends Expand Anodizers' Market. *Iron Age*, v. 177, Jan. 19, 1956, p. 74-77.

Aluminum curtain wall construction is rapidly expanding field for use of anodized sheet. Problems faced by anodizers, new equipment and methods, instrumentation for quality control of coating thickness. Photographs. (L19, T26, S14, Al)

227-L. Dual Spray Approach Can Tailor Your Coating Line. Martin Abel. *Iron Age*, v. 177, Jan. 19, 1956, p. 80-82.

Advantages of combining electrostatic and manual paint spraying. Procedures and equipment for coating of instrument panel housings. Photographs. (L26)

228-L. Technical Developments of 1955. Nathaniel Hall. *Metal Finishing*, v. 54, Jan. 1956, p. 43-52.

Review of literature and patents dealing with cleaning, pickling, polishing, aluminum plating and anodizing, metallic coatings, metallizing, conversion films, corrosion prevention, testing and control and waste treatment. 366 ref. (L general)

229-L. Practical Throwing Power. J. B. Mohler. *Metal Finishing*, v. 54, Jan. 1956, p. 53-55.

Plating bath formula, covering power, formulas for throwing power, solving metal distribution problems. Concludes that the experimental approach offers best possibilities for solution of throwing power problems at the present time. Diagrams, graphs. 7 ref. (L17)

230-L. Painting of Structural Steelwork. *Paint Technology*, v. 19, Dec. 1955, p. 417-420.

Effect of paint composition on its protective properties. Priming paints with linseed oil base are superior, probably due to greater film thickness. Photographs, tables. (To be continued.) (L26, ST)

231-L. Exchanger Preventive Maintenance Pays. R. Everett Butler and Russell P. Coleman. *Petroleum Refiner*, v. 35, Jan. 1956, p. 111-114.

Coordination among operating, inspection and maintenance departments, and good methods pay off in better performance and reduced downtime. Photographs. (L10, A5)

232-L. Finishing Office Equipment. Ezra A. Blount. *Products Finishing*, v. 20, Jan. 1956, p. 16-26.

Three compact, conveyorized painting and baking systems employed to apply one-coat baked wrinkle finish to metal office equipment. Photographs. (L26)

233-L. Notes on the Use of Water for Cleaning and Electroplating. Edward Engel. *Products Finishing*, v. 20, Jan. 1956, p. 38 + 5 pages.

Natural waters, metallic impurities, methods for softening water, discharge of waste liquids, costs of water. Photographs. (L12, L17)

234-L. Electroplating on Magnesium. Seymour Senderoff. *Products Finishing*, v. 20, Jan. 1956, p. 52 + 7 pages.

Steps involved for plating of magnesium and properties of the coatings. Graphs, photographs. (L17, Mg)

235-L. Top Quality Metal Processes Protect Today's Skyscrapers. *Products Finishing*, v. 20, Jan. 1956, p. 70-74, 76.

Finishing processes which protect building surfaces against corrosion and other weather conditions and maintain their attractive appearance. Photographs. (L general, T26, Al)

236-L. Plating With Carbide. Ralph H. Eshelman. *Tool Engineer*, v. 36, Jan. 1956, p. 117-122.

In the flame-plating process, a coating is deposited by blast tungsten carbide particles, in an explosive-gas carrier, through a gun. Properties of the base material and the coating are retained. Photographs, micrographs, diagrams, tables. (L24)

237-L. Improvement of Wear Resistance of Cold-Header Dies by Gas Chromizing. G. N. Dubinin and B. V. Gal'chenko. *Henry Brutcher Translation No.* 3633, 3 p. (From *Stanki i instrument*, v. 26, no. 8, 1955, p. 17.) Henry Brutcher, Altadena, Calif.

Chromized layers from 0.02 to 0.04 mm. thick produce dies with five to six times more service when correctly heat treated. Graph. (L15, Q9, T5, Cr)

238-L. (Dutch.) Hard Facing by Means of the Unionmelt Welding Method. P. G. Weeber. *Smit mededelingen*, v. 10, no. 3a, Dec. 1955, p. 125-132.

Advantages, welding instructions, detailed examples of process. Tables, graphs, diagrams, photographs. (L24)

239-L. (French.) Hot Galvanizing of Bolts and Small Pieces. A. Gordet. *Métallurgie et la construction mécanique*, v. 87, no. 12, Dec. 1955, p. 979, 981, 983.

Need of centrifuging to obtain high-quality pieces. Photographs, diagrams. (L16, Zn)

240-L. (German.) Behavior of Aluminum in Buffer Solution. A. R.

Tourky, W. Machu and K. Hussein. *Aluminium*, v. 31, no. 12, Dec. 1955, p. 599-604.

Effect of hydrogen ions on the aluminum oxide film, using buffer solutions and super-purity aluminum. Short-time exposures to solutions (pH4-8) reduced film porosity to a very low level. In alkaline buffers, a protective film forms which is promoted by phosphate ions and inhibited by chloride ions. Cathodic pretreatment causes a slight loosening of the natural oxide film, more intense in acid solution. Graphs, table. 14 ref. (L14, L25)

241-L. (German.) **Surface Condition of Aluminum Semiproducts Before Anodic Oxidation.** *VDI Zeitschrift*, v. 97, no. 36, Dec. 21, 1955, p. 1320.

Elimination of surface defects by means of pickling before cold rolling or adding grain refining materials. (L12, L19, Al)

242-L. (Russian.) **Effect of Temperature on the Rate of Electrodeposition of Copper From Sulfate Solutions.** G. A. Emel'ianenko. *Doklady akademii nauk SSSR*, v. 105, no. 5, Dec. 11, 1955, p. 1003-1006.

Relationships between temperature, current density and polarization. Graphs. 9 ref. (L17, Cu)

243-L. (Russian.) **Investigation of Processes Occurring During Hot Tinplating of Sheet Iron.** I. A. Kakovskii and N. S. Smirnov. *Izvestiia akademii nauk SSSR, otdelenie tekhnicheskikh nauk*, 1955, no. 12, Dec., p. 48-57.

Physical-chemical laws of the process. Reactive diffusion of molten tin into iron. Mechanism of action of the flux and its ability to dissolve oxide films on surface of sheet metal. Diagrams, tables. 16 ref. (L16, Fe, Sn)

244-L. Investigation of Barrel Finishing as a Means of Efficient Burr Removal. Charles E. Kincaid. *General Motors Engineering Journal*, v. 3, Jan.-Feb. 1956, p. 34-39.

Laboratory study leads to recommended procedures for successful work. Process saves in time and money, and produces uniform results. Photographs, diagrams. (L10, ST)

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246-L. Coating Tin Plate at Faster Speeds. E. C. Haskell. *National Lithographer*, v. 63, Jan. 1956, p. 71-72, 74.

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247-L. The Development of Coated Abrasives. R. W. Redmond. *Plating*, v. 43, Jan. 1956, p. 55-59.

Historical review. General description of various abrasives, backings, bonding materials. (L10, G18)

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Selection of tumbling media and compounds, setting up test runs, suitable shapes and sizes of parts to be finished. Photographs. (L10)

249-L. Polishing Grinding Wheels. R. W. Reed. *Plating*, v. 43, Jan. 1956, p. 64-66.

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Equipment and methods for abrasive belt polishing of flat sheet or strip steel. Diagrams, photographs, graphs, micrographs. (L10, ST)

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Nickel plating method using hydrogen peroxide to prevent pitting. Photographs. (L17, Ni)

256-L. Hardfacing Applications in the Iron and Steel Industry. M. Birkhead. *Welding and Metal Fabrication*, v. 24, Jan. 1956, p. 25-32.

Hardfacing techniques, choice of electrodes, service and other tests on ingot dog bits, hot shear blades, pneumatic punches. Micrographs, graphs, tables, photographs. 3 ref. (L24, Fe, ST)

257-L. Aircomatic Used to Repair Cast Nickel-Vanadium Steel. C. S. Sherman. *Western Machinery and Steel World*, v. 47, Jan. 1956, p. 90-91.

Use of stainless steel wire on nickel-vanadium steel ferry propellers gives entire blade areas sure protection against service erosion, while holding cost of repairs to bare minimum. Photographs, table. (L24, T22, SS, AY)

258-L. (German.) **Rust Pretreatment by Phosphoric Acid.** Gerhart Schultz. *Metalloberfläche*, Ausgabe B, v. 9, no. 12, Dec. 1955, p. 177-179.

Acid serves as a surface conditioner of steel prior to painting or application of other coatings. Photographs. 4 ref. (L12, L26)

259-L. (German.) **Studies of Residue on Metal Surfaces After Pickling.** Armin Petzold. *Metalloberfläche*, Ausgabe A, v. 9, no. 12, Dec. 1955, p. 205-207.

Pickling process in sulfuric and nitric acids. Analysis of pickling residue on metal. Tables. 5 ref. (L12, ST)

260-L. (German.) **Zinc Dust Compounds.** J. F. H. van Eijnsbergen. *Werkstoffe und Korrosion*, v. 6, no. 12, Dec. 1955, p. 571-575.

Zinc paint should contain enough zinc powder so the dry film will consist of 94% zinc. Protective action of the paint is due to cathodic protection as well as sealing off the atmosphere. Photographs. 27 ref. (L26, Zn)

261-L. (German.) **Progress in Electroplating.** Artur Kutzelnigg. *Werkstoffe und Korrosion*, v. 6, no. 12, Dec. 1955, p. 577-580.

Survey of German postwar progress in electroplating, including bright and leveling deposits, automatic plants, degreasing, nickel substitutes, anodic brightening and standardization. Photographs. (L17)

M

Metallography, Constitution and Primary Structures

85-M. Physical and X-Ray Study of the Disilicides of Titanium, Zirconium, and Hafnium. Perry G. Cotter, J. A. Kohn and R. A. Potter. *American Ceramic Society, Journal*, v. 39, Jan. 1956, p. 11-12.

Examination of the properties shows the compounds to be too brittle and have no value as industrial hard materials. Table. 10 ref. (M26, Q23, Ti, Zr, Hf)

86-M. The Effect of Temperature on the Lattice Spacings of Indium. J. Graham, A. Moore and G. V. Raynor. *Institute of Metals, Journal*, v. 84, Dec. 1955, p. 86-87.

Thermal-expansion coefficients have been determined for pure indinum from −183 to 135° C., using X-ray methods. The *c* parameter shows a maximum at about room temperature. Graphs. 7 ref. (M26, P11, In)

87-M. The Crystal Structures of Some Thorium Compounds. J. R. Murray. *Institute of Metals, Journal*, v. 84, Dec. 1955, p. 91-96.

Determination of the structures of four compounds in the thorium-aluminum system, one in the thorium-silver system and one in the thorium-gold system. Diagrams, tables. 13 ref. (M26, Th, Al, Ag, Au)

88-M. A Microbeam Back-Reflection X-Ray Camera. D. Lewis. *Journal of Scientific Instruments*, v. 32, Dec. 1955, p. 467-468.

A direct and accurate optical method of specimen location developed to be used with the camera. Exposure times were greatly reduced. Diagram, micrographs. 4 ref. (M22, Pt)

89-M. Dislocation Energies in NaCl. H. B. Huntington and J. E. Dickey. *Physical Review*, v. 100, ser. 2, Nov. 15, 1955, p. 1117-1128.

Energies for both screw and edge dislocations in rock salt have been investigated. The effect of elastic anisotropy has been incorporated into the contribution from the region outside the core. Detailed calculations have been carried out for the energies of the cores themselves as a function of radius, and joined smoothly to the curves of the elastic theory. The core calculations are based on the Born-Mayer model and employ the formulas of Madelung for the potentials of rows of uniformly spaced charges. Tables, diagrams. 18 ref. (M26)

90-M. Electrolytic Etching at Small-Angle Grain Boundaries in Germanium. S. G. Ellis. *Physical Review*, v. 100, ser. 2, Nov. 15, 1955, p. 1140-1141.

Difference of appearance between *n*-type and *p*-type germanium crystals, which have been anodically etched, can be explained if only the hole current contributes to the etching. An *n*-type crystal can be made to etch in the same way as a *p*-type crystal if injected holes reach the crystal-electrolyte interface. Hole-electron recombination within the crystal can then reduce the rate of etching. Diagrams. 4 ref. (M21, Ge)

91-M. (English.) **Sub-Boundaries in Aluminium Single Crystals.** Koichi Nakajima and Tomiya Sutoki. *Science Reports of the Research Institutes,*

Tohoku University, ser. A, v. 7, no. 4, Aug. 1955, p. 344-350.

Investigates the splitting of Laue spots from the crystallographic point of view, apart from the lineage structure, and clarifies the effects of these controlling factors. Micrographs, tables, diagrams. 5 ref. (M26, Al)

92-M. (French.) Preparation of Large Uranium Crystals by Change of Phase. Pierre Lehr. *Comptes rendus*, v. 241, no. 16, Oct. 17, 1955, p. 1043-1044.

Method proposed for X-ray determination of crystal orientation and the degree of their perfection. 1 ref. (M26, U)

93-M. (French.) Dilatometric Behavior of Alpha Uranium Monocrystals. Pierre Lehr and Jean-Paul Langeron. *Comptes rendus*, v. 241, no. 17, Oct. 24, 1955, p. 1130-1133.

Dilatometric behavior as a function of orientation. Determination of the value of linear expansion coefficient according to the three main crystallographic axes. Graph, table. 2 ref. (M23, U)

94-M. (French.) Determination of Transformation Points of Pure Iron. Christian Boulanger. *Comptes rendus*, v. 241, no. 17, Oct. 24, 1955, p. 1133-1135.

Utilization of differential thermal analysis and evaluation according to the international thermometric scale of 1948. Pure iron is refined by treatment in vacuum. 1 ref. (M23, Fe)

95-M. (French.) Influence of Small Amounts of Foreign Elements on the Structure of Cast Iron Pieces and on Their Cracking Tendencies. Pierre Détrez and Jeanne Cuvillier. *Fonderie*, Nov. 1955, no. 118, p. 4771-4785.

Study of cracks occurring in the solid state during cooling, either after stripping or enameling. Tables, micrographs, graphs. 8 ref. (M27, Q26, CI)

96-M. (French.) Influence of Gases on the Structure of Cast Iron. Georges Blanc and Nicolas Volianik. *Fonderie*, no. 118, Nov. 1955, p. 4755-4770; disc., p. 4770.

Study of the effects of oxygen, hydrogen, and nitrogen on properties of cast iron after different treatments. Diagrams, photographs, micrographs, tables. 33 ref. (M27, CI)

97-M. (Norwegian.) X-Ray and Magnetic Study of the System Cobalt Selenium. Frithjof Bohm, Fredrik Gronvold, Haakon Haraldsen and Harald Prydz. *Acta Chemica Scandinavica*, v. 9, no 9, 1955, p. 1510-1522.

X-ray studies revealed three intermediate phases, namely, beta, gamma and delta phases. Composition, structure and properties of each phase, and magnetic properties of the compounds. Tables, graphs. 27 ref. (M24, P16, Co)

98-M. Notes From the Conference on Uranium Metallography at Battelle Memorial Institute on July 10, 1949. R. F. Dickerson. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, TID-5076, Feb. 1952, 19 p.

Participating laboratories polished, etched, examined and photographed specimens which were fabricated and heat treated by Battelle. The objectives of the conference were to compare and discuss preparation and interpretation of the metallographic specimens. Micrographs. (M general, U)

99-M. Penetration of Electrons and Ions in Aluminum. J. R. Young. *Journal of Applied Physics*, v. 27, Jan. 1956, p. 1-4.

Range and energy loss of low-energy electrons and light ions in aluminum. Diagram, graphs. 21 ref. (M25, Al)

100-M. Melting Patterns Appearing on Single Crystals of InSb. M. F. Millea and C. T. Tomizuka. *Journal of Applied Physics*, v. 27, Jan. 1956, p. 96-97.

Preliminary results of the melting process reveal significant features of crystalline imperfections. Photographs. 2 ref. (M26, N12, In, Sb)

101-M. The Structure of Electrodeposited Metals. Rolf Weil and Harold J. Read. *Metal Finishing*, v. 54, Jan. 1956, p. 56-59.

Surface structures found in electroplated metals deposited under a variety of conditions classified; development of structures from a polished basis metal studied. Theory proposed to account for formation of various structural types, based on consideration of lattice structure of plated metal and quantity of growth-impeding material in cathode film. Micrographs. (M27, L17, Zn, Cd)

102-M. Microstructure and Hardness Variation of Some Precious Metals During Vacuum Heating. M. G. Lozinskii and S. G. Fedotov. *Henry Brutcher Translation No.* 3594, 6 p. (From *Izvestiya akademii nauk SSSR, OTN*, 1955, no. 5, p. 109-113.) Henry Brutcher, Altadena, Calif.

Hardness of the platinum group metals and their microstructures studied up to 1350° C. Table, graph, micrographs. 8 ref. (M27, Q29, EG-c, Au, Ag)

103-M. (Dutch.) Lattice Defects and Plastic Deformation of Metals. I. Type and Properties of Lattice Defects, in Particular, Dislocations. H. G. van Bueren. *Metalen*, v. 11, no. 1, Jan. 15, 1956, p. 2-8.

Treats geometrical aspects of different dislocations and their behavior under shear stress, as shown by development of slip lines, work hardening, changes in electrical conductivity. Graph, diagrams, micrographs. 9 ref. (To be continued.) (M26, Q24, P15)

104-M. (French.) Electron Diffraction Study of Thin Layers of Titanium and Its Oxides. Pierre Conjeaud. *Journal des recherches du centre national de la recherche scientifique*, 1955, no. 32, Sept., p. 273-290 + 4 plates.

Examination of thin layers, obtained by vacuum condensation of the vapor of alkaline halide monocrystals, shows three types of structures. The formation of different oxides and their reciprocal orientation. Diagrams, graphs, table. 19 ref. (M22, R2, Ti)

105-M. (German.) Hexagonal Structure in Mono-Crystals. II. Deposition of Impurities in Metal Crystals Solidifying From the Melt. F. Blaha. *Metall.* v. 9, nos. 23-24, Dec. 1955, p. 1077-1080.

Experiments and theoretical explanation of the phenomenon. Diagrams, graphs. 10 ref. (M26, N12)

106-M. (Russian.) Influence of Surface-Active Medium on the Irregular Deformation of Zinc Single Crystal. Iu. V. Goriunov, V. N. Rozhanskii and P. A. Rebinder. *Doklady akademii nauk SSSR*, v. 105, no. 3, Nov. 21, 1955, p. 448-450.

By decreasing surface tension, surface active substances facilitate the initiation of a new surface of dislocation. Graphs, photograph. 5 ref. (M26, N5, Zn)

107-M. (Russian.) Use of the Electron Microscope in Studying the Development Mechanism of Temper Brittleness in Steel. N. V. Kazakova and N. V. Koroleva. *Doklady akademii nauk SSSR*, v. 105, no. 6, Dec. 21, 1955, p. 1233-1235 + 1 plate.

Several variations of heat treatment to obtain temper brittleness in specimens for study. Grain boundaries show changes during processes of temper embrittlement and restoration of toughness. New phase appears with supplementary heating. Micrographs. 8 ref. (M21, Q23, AY)

108-M. X-Ray Diffraction Effects to Be Expected From Irradiated Uranium. W. M. Cashin and C. W. Tucker, Jr. *Knolls Atomic Power Laboratory (U. S. Atomic Energy Commission)*, KAPL-1158, Aug. 1954, 6 p.

Comparison of expected X-ray effects in irradiated uranium with effects in ionic, covalent and metallic crystals. Unique changes due to fission product formation. Table. 6 ref. (M22, M26, U)

109-M. Electron Emission From a Lattice Step on Clean Tungsten. J. K. Trolan, J. P. Barbour, E. E. Martin and W. P. Dyke. *Physical Review*, v. 100, ser. 2, Dec. 15, 1955, p. 1646-1649.

Proof that electron emission is observed from a surface irregularity of atomic dimension. Diagram, micrographs, table. 18 ref. (M26, W)

110-M. (English.) Two-Center Integrals for Iron Using Wave Functions With Exchange. M. Suffczynski. *Nuovo cimento*, v. 2, ser. 10, no. 6, Dec. 1955, p. 1320-1321.

Energy integrals for metallic body-centered iron computed by Wood's 3d1 function. 12 ref. (M25, Fe)

111-M. (German.) Investigation of Binary Metallic Systems by Means of the Amalgam Method. System: Iron-Tin. F. Lihl and H. Kirnbauer. *Monatshefte für Chemie*, v. 86, no. 6, 1955, p. 1031-1033.

Determination of proportions of the FeSn and $FeSn_2$ phases. Tables. 14 ref. (M24, Fe, Sn)

112-M. (German.) Microscopic Observation of Dilation of Zinc Monocrystals. Georg Masing and Klaus Schröder. *Zeitschrift für Metallkunde*, v. 46, no. 12, Dec. 1955, p. 860-866.

Studies of crystals with displacements in a favored sliding direction. Dislocations caused by bending stresses. Diagrams, micrographs. 15 ref. (M26, Q24, Zn)

113-M. (German.) Crystallography. Heinz Jagodzinski. Paper from "Handbook of Physics". v. VII. Pt. I. "Crystal Physics". Pt. I. Springer-Verlag, p. 1-103.

Crystal classes and space groups, symmetry and physical properties of homogeneous bodies, crystal geometry. Graphs, tables, diagrams. 47 ref. (M26, P general)

114-M. (German.) Lattice Theory of Mechanical and Thermal Properties of Crystals. Günther Leibfried. Paper from "Handbook of Physics". v. VII. Pt. I. "Crystal Physics". Pt. I. Springer-Verlag, p. 104-324.

Lattice mechanics and thermodynamics, calculation of elastic data, crystal oscillations, heat conductivity mechanisms. Tables, graphs, diagrams. 106 ref. (M26, Q21, P11, P12)

115-M. (German.) Theory of Lattice Defects. Alfred Seeger. Paper from "Handbook of Physics". v. VII. Pt. I. "Crystal Physics". Pt. I. Springer-Verlag, p. 383-665.

Theory of lattice displacements, dislocations, radiation damages. Tables, diagrams, graphs. 198 ref. (M26)

116-M. (Book.) Handbook of Physics. S. Flugge, Ed. v. VII. Pt. I. "Crystal Physics". Pt. I. 687 p. 1955. Springer-Verlag, Berlin, Germany.

English and German papers covering crystallography. Lattice theory of the mechanical and thermal properties of crystals. Specific heat of solids. Theory of grid failures. (M26, P12)

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257-L. Aircomatic Used to Repair Cast Nickel-Vanadium Steel. C. S. Sherman. *Western Machinery and Steel World*, v. 47, Jan. 1956, p. 90-91.

Use of stainless steel wire on nickel-vanadium steel ferry propellers gives entire blade areas sure protection against service erosion, while holding cost of repairs to bare minimum. Photographs, table. (L24, T22, SS, AY)

258-L. (German.) **Rust Pretreatment by Phosphoric Acid.** Gerhart Schultz. *Metalloberfläche*, Ausgabe B, v. 9, no. 12, Dec. 1955, p. 177-179.

Acid serves as a surface conditioner of steel prior to painting or application of other coatings. Photographs. 4 ref. (L12, L26)

259-L. (German.) **Studies of Residue on Metal Surfaces After Pickling.** Armin Petzold. *Metalloberfläche*, Ausgabe A, v. 9, no. 12, Dec. 1955, p. 205-207.

Pickling process in sulfuric and nitric acids. Analysis of pickling residue on metal. Tables. 5 ref. (L12, ST)

260-L. (German.) **Zinc Dust Compounds.** J. F. H. van Eijnsbergen. *Werkstoffe und Korrosion*, v. 6, no. 12, Dec. 1955, p. 571-575.

Zinc paint should contain enough zinc powder so the dry film will consist of 94% zinc. Protective action of the paint is due to cathodic protection as well as sealing off the atmosphere. Photographs. 27 ref. (L26, Zn)

261-L. (German.) **Progress in Electroplating.** Artur Kutzelnigg. *Werkstoffe und Korrosion*, v. 6, no. 12, Dec. 1955, p. 577-580.

Survey of German postwar progress in electroplating, including bright and leveling deposits, automatic plants, degreasing, nickel substitutes, anodic brightening and standardization. Photographs. (L17)

M

Metallography, Constitution and Primary Structures

85-M. Physical and X-Ray Study of the Disilicides of Titanium, Zirconium, and Hafnium. Perry G. Cotter, J. A. Kohn and R. A. Potter. *American Ceramic Society, Journal*, v. 39, Jan. 1956, p. 11-12.

Examination of the properties shows the compounds to be too brittle and have no value as industrial hard materials. Table. 10 ref. (M26, Q23, Ti, Zr, Hf)

86-M. The Effect of Temperature on the Lattice Spacings of Indium. J. Graham, A. Moore and G. V. Raynor. *Institute of Metals, Journal*, v. 84, Dec. 1955, p. 86-87.

Thermal-expansion coefficients have been determined for pure indinum from −183 to 135° C., using X-ray methods. The *c* parameter shows a maximum at about room temperature. Graphs. 7 ref. (M26, P11, In)

87-M. The Crystal Structures of Some Thorium Compounds. J. R. Murray. *Institute of Metals, Journal*, v. 84, Dec. 1955, p. 91-96.

Determination of the structures of four compounds in the thorium-aluminum system, one in the thorium-silver system and one in the thorium-gold system. Diagrams, tables. 13 ref. (M26, Th, Al, Ag, Au)

88-M. A Microbeam Back-Reflection X-Ray Camera. D. Lewis. *Journal of Scientific Instruments*, v. 32, Dec. 1955, p. 467-468.

A direct and accurate optical method of specimen location developed to be used with the camera. Exposure times were greatly reduced. Diagram, micrographs. 4 ref. (M22, Pt)

89-M. Dislocation Energies in NaCl. H. B. Huntington and J. E. Dickey. *Physical Review*, v. 100, ser. 2, Nov. 15, 1955, p. 1117-1128.

Energies for both screw and edge dislocations in rock salt have been investigated. The effect of elastic anisotropy has been incorporated into the contribution from the region outside the core. Detailed calculations have been carried out for the energies of the cores themselves as a function of radius, and joined smoothly to the curves of the elastic theory. The core calculations are based on the Born-Mayer model and employ the formulas of Madelung for the potentials of rows of uniformly spaced charges. Tables, diagrams. 18 ref. (M26)

90-M. Electrolytic Etching at Small-Angle Grain Boundaries in Germanium. S. G. Ellis. *Physical Review*, v. 100, ser. 2, Nov. 15, 1955, p. 1140-1141.

Difference of appearance between *n*-type and *p*-type germanium crystals, which have been anodically etched, can be explained if only the hole current contributes to the etching. An *n*-type crystal can be made to etch in the same way as a *p*-type crystal if injected holes reach the crystal-electrolyte interface. Hole-electron recombination within the crystal can then reduce the rate of etching. Diagrams. 4 ref. (M21, Ge)

91-M. (English.) **Sub-Boundaries in Aluminium Single Crystals.** Koichi Nakajima and Tomiya Sutoki. *Science Reports of the Research Institutes,*

Tohoku University, ser. A, v. 7, no. 4, Aug. 1955, p. 344-350.

Investigates the splitting of Laue spots from the crystallographic point of view, apart from the lineage structure, and clarifies the effects of these controlling factors. Micrographs, tables, diagrams. 5 ref. (M26, Al)

92-M. (French.) **Preparation of Large Uranium Crystals by Change of Phase.** Pierre Lehr. *Comptes rendus*, v. 241, no. 16, Oct. 17, 1955, p. 1043-1044.

Method proposed for X-ray determination of crystal orientation and the degree of their perfection. 1 ref. (M26, U)

93-M. (French.) **Dilatometric Behavior of Alpha Uranium Monocrystals.** Pierre Lehr and Jean-Paul Langeron. *Comptes rendus*, v. 241, no. 17, Oct. 24, 1955, p. 1130-1133.

Dilatometric behavior as a function of orientation. Determination of the value of linear expansion coefficient according to the three main crystallographic axes. Graph, table. 2 ref. (M23, U)

94-M. (French.) **Determination of Transformation Points of Pure Iron.** Christian Boulanger. *Comptes rendus*, v. 241, no. 17, Oct. 24, 1955, p. 1133-1135.

Utilization of differential thermal analysis and evaluation according to the international thermometric scale of 1948. Pure iron is refined by treatment in vacuum. 1 ref. (M23, Fe)

95-M. (French.) **Influence of Small Amounts of Foreign Elements on the Structure of Cast Iron Pieces and on Their Cracking Tendencies.** Pierre Détrez and Jeanne Cuvillier. *Fonderie*, Nov. 1955, no. 118, p. 4771-4785.

Study of cracks occurring in the solid state during cooling, either after stripping or enameling. Tables, micrographs, graphs. 8 ref. (M27, Q26, CI)

96-M. (French.) **Influence of Gases on the Structure of Cast Iron.** Georges Blanc and Nicolas Volianik. *Fonderie*, no. 118, Nov. 1955, p. 4755-4770; disc., p. 4770.

Study of the effects of oxygen, hydrogen, and nitrogen on properties of cast iron after different treatments. Diagrams, photographs, micrographs, tables. 33 ref. (M27, CI)

97-M. (Norwegian.) **X-Ray and Magnetic Study of the System Cobalt Selenium.** Frithjof Bohm, Fredrik Gronvold, Haakon Haraldsen and Harald Prydz. *Acta Chemica Scandinavica*, v. 9, no 9, 1955, p. 1510-1522.

X-ray studies revealed three intermediate phases, namely, beta, gamma and delta phases. Composition, structure and properties of each phase, and magnetic properties of the compounds. Tables, graphs. 27 ref. (M24, P16, Co)

98-M. Notes From the Conference on Uranium Metallography at Battelle Memorial Institute on July 10, 1949. R. F. Dickerson. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, TID-5076, Feb. 1952, 19 p.

Participating laboratories polished, etched, examined and photographed specimens which were fabricated and heat treated by Battelle. The objectives of the conference were to compare and discuss preparation and interpretation of the metallographic specimens. Micrographs. (M general, U)

99-M. Penetration of Electrons and Ions in Aluminum. J. R. Young. *Journal of Applied Physics*, v. 27, Jan. 1956, p. 1-4.

Range and energy loss of low-energy electrons and light ions in aluminum. Diagram, graphs. 21 ref. (M25, Al)

100-M. Melting Patterns Appearing on Single Crystals of InSb. M. F. Millea and C. T. Tomizuka. *Journal of Applied Physics*, v. 27, Jan. 1956, p. 96-97.

Preliminary results of the melting process reveal significant features of crystalline imperfections. Photographs. 2 ref. (M26, N12, In, Sb)

101-M. The Structure of Electrodeposited Metals. Rolf Weil and Harold J. Read. *Metal Finishing*, v. 54, Jan. 1956, p. 56-59.

Surface structures found in electroplated metals deposited under a variety of conditions classified; development of structures from a polished basis metal studied. Theory proposed to account for formation of various structural types, based on consideration of lattice structure of plated metal and quantity of growth-impeding material in cathode film. Micrographs. (M27, L17, Zn, Cd)

102-M. Microstructure and Hardness Variation of Some Precious Metals During Vacuum Heating. M. G. Lozinskii and S. G. Fedotov. *Henry Brutcher Translation No.* 3594, 6 p. (From *Izvestiya akademii nauk SSSR, OTN*, 1955, no. 5, p. 109-113.) Henry Brutcher, Altadena, Calif.

Hardness of the platinum group metals and their microstructures studied up to 1350° C. Table, graph, micrographs. 8 ref. (M27, Q29, EG-c, Au, Ag)

103-M. (Dutch.) **Lattice Defects and Plastic Deformation of Metals. I. Type and Properties of Lattice Defects, in Particular, Dislocations.** H. G. van Bueren. *Metalen*, v. 11, no. 1, Jan. 15, 1956, p. 2-8.

Treats geometrical aspects of different dislocations and their behavior under shear stress, as shown by development of slip lines, work hardening, changes in electrical conductivity. Graph, diagrams, micrographs. 9 ref. (To be continued.) (M26, Q24, P15)

104-M. (French.) **Electron Diffraction Study of Thin Layers of Titanium and Its Oxides.** Pierre Conjeaud. *Journal des recherches du centre national de la recherche scientifique*, 1955, no. 32, Sept., p. 273-290 + 4 plates.

Examination of thin layers, obtained by vacuum condensation of the vapor of alkaline halide monocrystals, shows three types of structures. The formation of different oxides and their reciprocal orientation. Diagrams, graphs, table. 19 ref. (M22, R2, Ti)

105-M. (German.) **Hexagonal Structure in Mono-Crystals. II. Deposition of Impurities in Metal Crystals Solidifying From the Melt.** F. Blaha. *Metall*, v. 9, nos. 23-24, Dec. 1955, p. 1077-1080.

Experiments and theoretical explanation of the phenomenon. Diagrams, graphs. 10 ref. (M26, N12)

106-M. (Russian.) **Influence of Surface-Active Medium on the Irregular Deformation of Zinc Single Crystal.** Iu. V. Goriunov, V. N. Rozhanskii and P. A. Rebinder. *Doklady akademii nauk SSSR*, v. 105, no. 3, Nov. 21, 1955, p. 448-450.

By decreasing surface tension, surface active substances facilitate the initiation of a new surface of dislocation. Graphs, photograph. 5 ref. (M26, N5, Zn)

107-M. (Russian.) **Use of the Electron Microscope in Studying the Development Mechanism of Temper Brittleness in Steel.** N. V. Kazakova and N. V. Koroleva. *Doklady akademii nauk SSSR*, v. 105, no. 6, Dec. 21, 1955, p. 1233-1235 + 1 plate.

Several variations of heat treatment to obtain temper brittleness in specimens for study. Grain boundaries show changes during processes of temper embrittlement and restoration of toughness. New phase appears with supplementary heating. Micrographs. 8 ref. (M21, Q23, AY)

108-M. X-Ray Diffraction Effects to Be Expected From Irradiated Uranium. W. M. Cashin and C. W. Tucker, Jr. *Knolls Atomic Power Laboratory (U. S. Atomic Energy Commission)*, KAPL-1158, Aug. 1954, 6 p.

Comparison of expected X-ray effects in irradiated uranium with effects in ionic, covalent and metallic crystals. Unique changes due to fission product formation. Table. 6 ref. (M22, M26, U)

109-M. Electron Emission From a Lattice Step on Clean Tungsten. J. K. Trolan, J. P. Barbour, E. E. Martin and W. P. Dyke. *Physical Review*, v. 100, ser. 2, Dec. 15, 1955, p. 1646-1649.

Proof that electron emission is observed from a surface irregularity of atomic dimension. Diagram, micrographs, table. 18 ref. (M26, W)

110-M. (English.) **Two-Center Integrals for Iron Using Wave Functions With Exchange.** M. Suffczynski. *Nuovo cimento*, v. 2, ser. 10, no. 6, Dec. 1955, p. 1320-1321.

Energy integrals for metallic body-centered iron computed by Wood's 3*d*1 function. 12 ref. (M25, Fe)

111-M. (German.) **Investigation of Binary Metallic Systems by Means of the Amalgam Method. System: Iron-Tin.** F. Lihl and H. Kirnbauer. *Monatshefte für Chemie*, v. 86, no. 6, 1955, p. 1031-1033.

Determination of proportions of the FeSn and $FeSn_2$ phases. Tables. 14 ref. (M24, Fe, Sn)

112-M. (German.) **Microscopic Observation of Dilation of Zinc Monocrystals.** Georg Masing and Klaus Schröder. *Zeitschrift für Metallkunde*, v. 46, no. 12, Dec. 1955, p. 860-866.

Studies of crystals with displacements in a favored sliding direction. Dislocations caused by bending stresses. Diagrams, micrographs. 15 ref. (M26, Q24, Zn)

113-M. (German.) **Crystallography.** Heinz Jagodzinski. Paper from "Handbook of Physics". v. VII. Pt. I. "Crystal Physics". Pt. I. Springer-Verlag, p. 1-103.

Crystal classes and space groups, symmetry and physical properties of homogeneous bodies, crystal geometry. Graphs, tables, diagrams. 47 ref. (M26, P general)

114-M. (German.) **Lattice Theory of Mechanical and Thermal Properties of Crystals.** Günther Leibfried. Paper from "Handbook of Physics". v. VII. Pt. I. "Crystal Physics". Pt. I. Springer-Verlag, p. 104-324.

Lattice mechanics and thermodynamics, calculation of elastic data, crystal oscillations, heat conductivity mechanisms. Tables, graphs, diagrams. 106 ref. (M26, Q21, P11, P12)

115-M. (German.) **Theory of Lattice Defects.** Alfred Seeger. Paper from "Handbook of Physics". v. VII. Pt. I. "Crystal Physics". Pt. I. Springer-Verlag, p. 383-665.

Theory of lattice displacements, dislocations, radiation damages. Tables, diagrams, graphs. 198 ref. (M26)

116-M. (Book.) **Handbook of Physics.** S. Flugge, Ed. v. VII. Pt. I. "Crystal Physics". Pt. I. 687 p. 1955. Springer-Verlag, Berlin, Germany.

English and German papers covering crystallography. Lattice theory of the mechanical and thermal properties of crystals. Specific heat of solids. Theory of grid failures. (M26, P12)

117-M. (Book.) **Small-Angle Scattering of X-Rays.** André Guinier and Gérard Fournet. (Translated from the French by Christopher B. Walker.) Structure of Matter Series. 268 p. 1955. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $7.50.

Theoretical and experimental data presented in complex form for the specialist. Uses and applications are presented in simple form for the nonspecialist, so that he may evaluate its use in his field. (M22)

118-M. (Book—Italian.) **Course in Metallography.** Leno Matteoli. 525 p. 1954. Associazione Italiana di Metallurgia Centro di Metallografia, Torino, Italy.

A complete and detailed study of metallography. (M general)

N

Transformations and Resulting Structures

78-N. Transformation Kinetics of Uranium-Molybdenum Alloys. H. A. Saller, F. A. Rough and A. A. Bauer. *Battelle Memorial Institute (U. S. Atomic Energy Commission),* BMI-957, Oct. 1954, 26 p.

Investigates nature of the transformation product and kinetics of the metastable-gamma decomposition. Graphs, micrographs, table. 7 ref. (N6, U, Mo)

79-N. Thermal Diffusion in Liquid Metals. F. R. Winter and H. G. Drickamer. *Journal of Physical Chemistry,* v. 59, Dec. 1955, p. 1229-1230.

Theories on thermal diffusion in liquids and their application to data on binary organic mixtures. Results presented and discussed for three ternary mixtures. Graph, table. 8 ref.
(N1, Sn, Cd, Pb, Zn, Bi, Ga)

80-N. (English.) **Effect of Stresses on Hydrogen Diffusion in Steel.** F. de Kazinczy. *Jernkontorets annaler,* v. 139, no. 11, 1955, p. 885-892.

Hydrogen flow increases proportionally to stress up to the yield point, which indicates homogeneous diffusion through the lattice in annealed steel. Plastic deformation increases rate of flow, which may be due to stress multiplication in certain zones, probably along slip planes, in which hydrogen flow is thereby increased. Graphs, diagram. 9 ref. (N1, Q24, ST)

81-N. (French.) **Preparation of Monocrystals With Low Fusion Point. Description of New Equipment and Initial Results.** G. P. Bolognesi. *Revue de métallurgie,* v. 52, no. 11, Nov. 1955, p. 909-911.

Uses a vertical continuous-heating furnace which automatically adjusts mold temperatures up to 1000° C. Graph, diagrams, photographs. 4 ref. (N12)

82-N. (French.) **Processes to Obtain a Polygonized State With an Alpha-Brass Solid Solution.** H. J. Latiere and R. Michaud. *Revue de métallurgie,* v. 52, no. 11, Nov. 1955, p. 912-914.

Polygonized alpha-brass was made by fusion and quick cooling to avoid monocrystallization. Further working and annealing were required for stability. Laue patterns. 9 ref. (N5, Cu)

83-N. (German.) **Optical Investigation of the Reciprocal Diffusion of Metals.** Herwig Schopper. *Zeitschrift für Physik,* v. 143, no. 1, 1955, p. 93-117.

Determination of small diffusion coefficients for gold-lead alloys. (N1, Pb, Au)

84-N. (Russian.) **Pearlitic Transformation in Alloy Steel.** M. E. Blanter. *Metallovedenie i obrabotka metallov,* 1955, no. 4, Oct., p. 1-15.

Formation of carbides, and change of chromium, manganese, silicon, molybdenum and other contents in carbides and ferrite in relation to isothermal annealing time. Effect of alloying elements on kinetics of pearlitic transformation. Graphs, micrographs. 37 ref. (N8, AY)

85-N. (Russian.) **Effect of Stresses on the Processes of Aging the Alloy EI 437 at 750° C.** V. A. Parfenov. *Metallovedenie i obrabotka metallov,* no. 4, Oct. 1955, p. 16-19.

Microstructures and microcracks in fatigue-tested specimens. Micrographs. 10 ref.
(N7, M27, Q25, Cr, Ni)

86-N. (Russian.) **Influence of Alloying Elements on the Graphitization Kinetics of White Cast Iron.** M. A. Krishtal. *Metallovedenie i obrabotka metallov,* no. 4, Oct. 1955, p. 24-27.

Order of intensity of influence by Al, Si, Ni, Co, Cu, V and Cr. Relation between distortion of lattice of alloyed austenite and absolute magnitude of difference of atomic diameters of alloying element and iron. Table. 21 ref. (N8, CI)

87-N. (Russian.) **Relation Between Position of Martensitic Point and State of the Austenite.** G. A. Oding. *Metallovedenie i obrabotka metallov,* no. 4, Oct. 1955, p. 28-31.

Intensiveness of austenitic transformation. Effect of rate of cooling. Stresses in individual austenitic grains. Graphs. 9 ref. (N8, ST)

88-N. (Russian.) **Causes of Crack Formation in Carburized Parts and Preventive Measures.** E. I. Malinkina. *Metatllovedenie i obrabotka metallov,* no. 4, Oct. 1955, p. 39-47.

Effect of carbon-content-temperature relation on austenitic-martensitic transformation and of isothermal transformation time, at various temperatures, on structure of carburized layer. Distribution of residual stresses. Graphs, micrographs, photographs. (N8, J28, Q26, ST)

89-N. Continuous-Cooling Transformation Diagram and Weldability of a 2¼% Ni-Cr-Mo Steel. B. J. Bradstreet. *British Welding Journal,* v. 3, Jan. 1956, p. 30-32.

Preparation of the steel, weldability tests, dilation tests. Conditions for crack-free welds using low-hydrogen ferritic electrodes or austenitic electrodes. Tables, graphs, photograph. 9 ref. (N8, K9, ST)

90-N. Effect of Neutron Irradiation on the Precipitation-Hardening Reaction in Alloys Containing Beryllium. R. H. Kernohan, D. S. Billington and A. B. Lewis. *Journal of Applied Physics,* v. 27, Jan. 1956, p. 40-42.

Experimentation shows that neutron bombardment leads to the precipitation of more beryllium from solid solution than is obtained in an alloy held at the same temperature but in the absence of neutron bombardment. Graph. 10 ref.
(N7, Be)

91-N. Complex Growths of Graphite Spherulites in Cast Irons. K. P. Bunin, Yu. N. Taran and T. M. Shpak. *Henry Brutcher Translation No.* 3623, 4 p. (Abridged from *Doklady akademii nauk SSSR,* v. 101, no. 1, 1955, p. 65-67.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 214-N, 1955. (N12, CI)

92-N. (French.) **Summary Study of Isothermal Transformations in Duralumin.** Marcel Tournaire and Martial Renouard. *Technique et science aéronautiques,* 1955, no. 5, p. 297-302.

Isothermal quenching used for study of transformation curves in duralumin. Graphs. (N6, Al)

93-N. (German.) **Investigation of Phase Transformation in Austenitic Manganese Steel, Especially With Magnetite Suspension.** Kurt Hans v. Klitzing. *Archiv für das Eisenhüttenwesen,* v. 26, no. 12, Dec. 1955, p. 755-759.

Microscopic investigation of transformations after deformation, tempering at 350 to 650° C., and after low-temperature cooling in liquid air, with and without etching in picric acid solution. Micrographs. 14 ref. (N8, AY)

94-N. (German.) **Investigation of Growth in Austenitic Cast Iron.** W. Heinrichs and A. Dahlmann. *Technische Mitteilungen Krupp,* v. 13, no. 7, Dec. 1955, p. 147-166.

Contrary to the opinion that growth results from decomposition of carbide, a transformation of austenite and graphite into carbide at 750° C. could be observed. The length growth up to 550° C. is not greater than 0.70% and a growth of 0.40% probably will be obtained at 550° C. as a limiting value. Tables, graphs, diagram, micrographs. 12 ref. (N8, CI)

95-N. (Russian.) **Diffusion of Chromium in Solid Solutions of Nickel Alloys.** P. L. Gruzin and G. B. Fedorov. *Doklady akademii nauk SSSR,* v. 105, no. 2, Nov. 11, 1955, p. 264-267.

Diffusion coefficients determined by radioactive indicators. Relation of energy of activation to melting point of the various alloys tested. Tables, graphs. 8 ref. (N1, P12, Ni)

96-N. (Russian.) **Crystal Structure and Nature of Omega-Phase in Alloys of Titanium With Chromium.** Iu. A. Bagariatskii, G. I. Nosova and T. V. Tagunova. *Doklady akademii nauk SSSR,* v. 105, no. 6, Dec. 21, 1955, p. 1225-1228 + 1 plate.

Degree of dislocation in beta-omega transition and reorganization of lattice, even during rapid cooling, indicates a nondiffusion, martensitic type of transformation in an alloy with 5% chromium. Character of martensitic structures with supercooling depends on concentration of second element with titanium. X-ray diffractogram, diagrams, tables. 5 ref. (N9, M26, Ti, Cr)

97-N. (Russian.) **Effect of Pressure on Transformation of Austenite Into Martensite.** A. I. Stregulin and N. P. Chuprakova. *Doklady akademii nauk SSSR,* v. 105, no. 6, Dec. 21, 1955, p. 1241-1243.

Relation between martensitic point and pressure. Comparison with and without pressure during cooling. Diagram, graphs, table. (N8, AY)

98-N. (Russian.) **Diffusion of Cobalt-60 in Cobalt Ferrites.** A. I. Borisenko and E. I. Morozov. *Doklady akademii nauk SSSR,* v. 105, no. 6, Dec. 21, 1955, p. 1274-1277.

Relation between temperature, composition and diffusion coefficient. Diffusion parameters. Graphs, table. 14 ref. (N1, Co, Fe)

99-N. (Russian.) **Use of Radioactive Isotopes to Study Effect of High-Melting Elements on Self-Diffusion of Iron.** S. Z. Bokshtein, V. A. Kazakova, S. T. Kishkin and L. M. Mirskii. *Izvestiia akademii nauk SSSR, otdelenie tekhnicheskikh nauk,* 1955, no. 12, Dec., p. 18-27.

Mechanism of diffusion underlying processes involved during heat treatment in metallic alloys. Decisive character of diffusion for behavior of metals, particularly at

high temperatures. Effect of third component on temperature of self-diffusion. Tables, graphs. 11 ref. (N1, J general, Fe, Ni)

100-N. (Russian.) Transfer of Potassium Ions in Simpler Liquid Slags. O. A. Esin and A. K. Kir'ianov. *Izvestiia akademii nauk SSSR, otdelenie tekhnicheskikh nauk,* 1955, no. 12, Dec., p. 28-34.

To clarify nature of the slags, an investigation is undertaken to determine whether molten slags are electrolytes or semiconductors, by observing the rate of distribution and diffusion of "tagged" slag, and by variation of intensity with time in various divisions of electrolyzer before and during passage of current. Tables, graph, diagrams. 7 ref. (N14, B18)

101-N. (Russian.) Defects of Crystal Structure of Quenched Steel. K. P. Bunin and E. N. Pogrebnoi. *Izvestiia akademii nauk SSSR, otdelenie tekhnicheskikh nauk,* 1955, no. 12, Dec., p. 136-139.

Lattice distortions and microcracks in hardened martensite and austenite. Effect of quenching and other heat treatment on graphitization of iron-carbon alloys. Micrographs, graph. 10 ref. (N8, M26, J26, Fe, CN)

102-N. (Russian.) Process of Graphite Formation in Magnesium Cast Iron. K. I. Vashchenko and L. M. Sofroni. *Liteinoe proizvodstvo,* 1955, no. 11, Nov., p. 17-25.

Graphite content substantially below the eutectic crystallization temperature. Microstructure reveals that graphitization takes place in the solid state. Effect of chemical composition on graphitization. Tables, graphs, micrographs. 7 ref. (N8, M27, CI, Mg)

103-N. Theory of Nodular Graphite Formation in Ductile Cast Iron. Paul H. Anderson. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 163-169; disc., p. 169.

Hypothesis takes into account the effect of surface energies involved in the formation of graphite nodules from carbon precipitate rejected from the iron matrix. Crystallization of the graphite nodules is in the direction from the graphite-metal interface toward the nodule center. Diagram, tables. 14 ref. (N12, CI)

104-N. X-Ray Measurements of Order in the Cobalt-Platinum System. P. S. Rudman and B. L. Averbach. *Massachusetts Institute of Technology Department of Metallurgy (U. S. Atomic Energy Commission),* NYO-7051, Sept. 1955, 18 p.

Long-range order measured by means of X-ray intensity and lattice tetragonality measurements on powder briquettes quenched from various annealing temperatures. Graphs. 16 ref. (N10, Co, Pt)

105-N. Field Emission Microscopy of an Allotropic Transformation: α-β Titanium. Ernest G. Brock. *Physical Review,* v. 100, ser. 2, Dec. 15, 1955, p. 1619-1626.

Results show how the field emission microscope can be used to observe phase transformations in crystals of titanium; how a unique orientation relation between two phases can be demonstrated; and how individual crystals can be studied in their intermediate forms as they change phase. Diagrams, micrographs. 23 ref. (N6, M21, Ti)

106-N. Diffusion of Zinc in Single Crystals of Silver. A. Sawatzky and F. E. Jaumot, Jr. *Physical Review,* v. 100, ser. 2, Dec. 15, 1955, p. 1627-1629.

Studies at 640 to 925° C. An equation is derived which gives the diffusion coefficient with an accuracy of ±2%. Graphs, table. 4 ref. (N1, Zn, Ag)

107-N. Effect of Antimony Impurity on Self-Diffusion of Silver. E. Sonder. *Physical Review,* v. 100, ser. 2, Dec. 15, 1955, p. 1662-1666.

Measurements on alloy single crystals over a range of 5.0 to 900° C. to determine the existence and magnitude of changes, due to impurities, of the activation energy and frequency factor. Graphs, tables. 14 ref. (N1, Sb, Ag)

108-N. Effect of Pressure on the Superconducting Transition Temperature of Thallium. J. Hatton. *Physical Review,* v. 100, ser. 2, Dec. 15, 1955, p. 1784.

Investigations made at pressure up to nearly 5000 kg/cm². Graphs. 2 ref. (N11, P15, Tl)

109-N. Recrystallization and Grain Growth Characteristics in Zirconium and Zirconium-Tin Alloys. F. D. Rosi and F. C. Perkins. *Sylvania Electric Products, Inc. (U. S. Atomic Energy Commission),* SEP-113, June 1953, 36 p.

Information on alloy deformability by rolling, temperature range of recrystallization for several deformations, and temperature dependence of recrystallization and grain growth processes. Graphs, micrographs, tables. 18 ref. (N3, N5, Q24, Sn, Zr)

110-N. (Spanish.) Contribution to the Study of the Secondary Hardening of Steels and Applications to Creep-Resistant Steels. A. Constant and G. Delbart. *Instituto del hierro y del acero,* v. 8, no. 39, Oct. 1955, p. 441-458.

Examines different compounds, especially carbides and intermetallic compounds, whose precipitation is capable of producing hardening. Graphs, micrographs, tables. 22 ref. (N7, Q3, ST)

111-N. (Spanish.) The Structure of Steel Ingots and Their Transformation by Known Forging and Rolling Processes. Bernhard Matuschka. *Instituto del hierro y del acero,* v. 8, no. 39, Oct. 1955, p. 496-519.

Crystal structure and segregation in ingots, homogenization, variation of primary structure and crystallites during heating, mixing and decomposition of segregation zones, production of large forged pieces. Phase diagrams, photographs, table. (N5, M27, F21, F22, F23, ST)

112-N. (Spanish.) Results of Measuring Damping in the Investigation of Iron. Werner Köster. *Instituto del hierro y del acero,* v. 8, no. 39, Oct. 1955, p. 520-540.

Theory of delayed mechanical effects in technical irons, determination of solubility and diffusion coefficient of carbon and nitrogen in alpha-iron, kinetics of precipitation of carbon and nitrogen, influence of third elements, damping of deformed steel. Diagrams, graphs, micrographs. 36 ref. (N general, Q8, Fe)

P
Physical Properties and Test Methods

82-P. Heat Capacity of Erbium From 15 to 320° K. R. E. Skochdopole, Maurice Griffel and F. H. Spedding. *Journal of Chemical Physics,* v. 23, Dec. 1955, p. 2258-2263.

Thermodynamic functions were calculated and three maxima observed which occur at 19.9, 53.5, and 84° K. Correlation of the various contributions to the entropy at room temperature was made and extended to the other rare earth metals. Tables, graphs. 19 ref. (P12, Er)

83-P. On the Optical Properties of Solids. Herbert B. Rosenstock. *Journal of Chemical Physics,* v. 23, Dec. 1955, p. 2415-2421.

Treatment of the usual linear theory of lattice vibrations in ionic crystals, without the use of the simplifying cyclic boundary conditions, leads to an electric moment associated with each normal frequency which is a quasicontinuous function of the propagation vector. Diagram, table. 20 ref. (P17)

84-P. Effect of Shape Anisotropy on the Coercive Force of Elongated Single-Magnetic-Domain Iron Particles. T. O. Paine, L. I. Mendelsohn and F. E. Luborsky. *Physical Review,* v. 100, ser. 2, Nov. 15, 1955, p. 1055-1059.

Particles, 150 A. in diameter, have been prepared with properties that definitely confirm the existence of a shape anisotropy effect on coercive force. Micrographs, diagrams. 31 ref. (P16, Fe)

85-P. An Approach to Elongated Fine-Particle Magnets. I. S. Jacobs and C. P. Bean. *Physical Review,* v. 100, ser. 2, Nov. 15, 1955, p. 1060-1067.

Coercive force predicted by theory for single-domain particles with shape anisotropy frequently far exceeds the observed value. Several approximate models suggested which may exist in certain experimental situations. Detailed calculations presented for a "chain-of-spheres" model remagnetizing by several mechanisms. Diagrams, tables, graphs. 22 ref. (P16, Fe)

86-P. Electrical Properties of Near-Degenerate Boron-Doped Silicon. R. O. Carlson. *Physical Review,* v. 100, ser. 2, Nov. 15, 1955, p. 1075-1078.

Measurements of extrinsic resistivity and Hall effect have been carried out for a group of silicon single crystals containing a wide range of boron concentration, with particular stress on samples in the near-degenerate range, 10^{18} to 10^{19} boron atoms per cc. Graphs, table. 10 ref. (P15, Si)

87-P. Mean Free Path for Discrete Electron Energy Losses in Metallic Foils. A. W. Blackstock, R. H. Ritchie and R. D. Birkoff. *Physical Review,* v. 100, ser. 2, Nov. 15, 1955, p. 1078-1083.

Energy losses studied as a function of incident energy. In foils of aluminum, magnesium and copper, bombarded with electrons of energies 25 to 115 k.e.v., the losses appear at multiples of 14.9 and 10.7 e.v., respectively, for aluminum and magnesium, whereas only one loss is found in copper at 22.6 e.v. The mean free paths for the losses are determined for the three metals. Table, graphs. 26 ref. (P12, Al, Mg, Cu)

88-P. Magnetic Susceptibility of Germanium. D. K. Stevens, J. W. Cleland, J. H. Crawford, Jr., and H. C. Schweinler. *Physical Review,* v. 100, ser. 2, Nov. 15, 1955, p. 1084-1093.

Magnetic behavior of a variety of specimens measured as a function of temperature over the range from 70 to 300° K. Measurements also made on one *n*-type specimen bombarded with fast neutrons. Graphs, tables. 34 ref. (P16, Ge)

89-P. Recombination Processes in Tellurium. David Redfield. *Physical Review,* v. 100, ser. 2, Nov. 15, 1955, p. 1094-1100.

Recombination processes in tellurium investigated by photo conduc-

tivity techniques. Studies on single crystals having acceptor densities of about 10^{16} per cc. By using pulsed illumination, the decay time constant of the photocurrent was found to be 20μ sec., in fairly good agreement with results obtained previously from steady-state photocurrent sensitivity. Diagrams. 18 ref. (P15, Te)

90-P. Influence of Crystalline Electric Fields on Antiferromagnetic Transitions. L. D. Roberts, R. B. Murray and J. W. T. Dabbs. *Physical Review*, v. 100, ser. 2, Nov. 15, 1955, p. 1100-1103.

Treatment of Van Vleck is extended to include a crystalline electric field term, through use of the effective spin Hamiltonian. Diagram. 12 ref. (P16, Mn Gd, Cr, V)

91-P. Soft X-Ray Absorption of Tellurium and Vitreous and Metallic Selenium. M. Parker Givens, Charles J. Koester and William L. Goffe. *Physical Review*, v. 100, ser. 2, Nov. 15, 1955, p. 1112-1115.

The absorption of metallic selenium is compared with that of the vitreous form in the region from 200 to 240 A. For these two forms of selenium and for tellurium, the absorption band is separated into two component bands. This has led to a revised estimate of 1.2 e.v. for the separation of the M_{IV} and M_V levels of selenium and 1.6 e.v. for the separation of the N_{IV} and N_V levels of tellurium. Diagrams, table. 9 ref. (P12, M26, Te, Se)

92-P. Conductivity, Hall Effect, and Magnetoresistance in *n*-Type Germanium, and Their Dependence on Pressure. George B. Benedek, William Paul and Harvey Brooks. *Physical Review*, v. 100, ser. 2, Nov. 15, 1955, p. 1129-1139.

Examination of the galvanomagnetic properties using the application of high hydrostatic pressure as a means of varying the energy-band structure. Diagrams, tables. 22 ref. (P15, Ge)

93-P. Magnetic Susceptibility of Sodium Metal. Raymond Bowers. *Physical Review*, v. 100, ser. 2, Nov. 15, 1955, p. 1141-1144.

Total susceptibility is measured from room temperature down to 55° K. using the Gouy technique. Experimental difficulties encountered in attempt to measure susceptibility at liquid helium temperatures. Diagram, tables. 16 ref. (P16, Na)

94-P. The Specific Heats of Potassium, Rubidium and Caesium at Temperatures Below 330° K. T. M. Dauphinee, Douglas L. Martin and H. Preston-Thomas. *Royal Society, Proceedings*, v. 233, ser. A, Dec. 20, 1955, p. 214-222.

Anomalies were found in the specific heats of all these metals. The anomaly in rubidium is found to be affected by heat treatment of the sample. The caesium measurements give direct calorimetric information relating to the caesium-oxygen binary system. Graphs, tables. 14 ref. (P12, Na, K, Cs, Rb)

95-P. (English.) **Thermodynamic Properties of Alpha and Beta Silver-Magnesium Alloys.** Sukeji Kachi. *Science Reports of the Research Institutes, Tohoku University*, ser. A, v. 7, no. 4, Aug. 1955, p. 351-364.

Properties investigated, by electrochemical techniques, between 350 and 500° C. showed the degree of disorder alpha in the beta phase to be of the order of 10^{-4}, the enthalpies of mixing were negative and had marked maximum absolute value at the composition 1:1, and the existence of Ag_3Mg superlattice was confirmed from the e.m.f. and specific heat measurements. Graphs, tables, diagram. 19 ref. (P12, N10, Ag, Mg)

96-P. (English.) **On the Positions of the Equivalent Poles in a Magnetized Bar Tested by the Magnetometer Method. II. Tungsten Magnet Steel and K. S. Magnet Steel.** Hakaru Masumoto and Makoto Sugihara. *Science Reports of the Research Institutes, Tohoku University*, ser. A, v. 7, no. 4, Aug. 1955, p. 377-384.

Distribution of free magnestism in bars, in various states of magnetization, was measured by drawing out a search coil along the axis of the specimen. Tables, graphs. (P16, ST)

97-P. (French.) **Study of the Electrical Anisotropy of Gallium in the Vicinity of the Melting Point.** Israel Epelboin and Marc Erny. *Comptes rendus*, v. 241, no. 17, Oct. 24, 1955, p. 1118-1121.

Variation of the electrical resistivity of the monocrystals as a function of temperature. Graph. 5 ref. (P15, Ga)

98-P. (German.) **The Magnetic Behavior of Electrolytic Chromium.** R. Lingelbach. *Zeitschrift für physikalische Chemie (Frankfurt)*, v. 5, nos. 5-6, Nov. 1955, p. 273-283.

Susceptibility measurement of tempered and nontempered electrolytic chromium between 66 and 293° K. Graphs. 22 ref. (P16, Cr)

99-P. (Russian.) **Electrical Properties of Cadmium Telluride.** B. I. Boltaks, P. P. Konorov and O. A. Matveev. *Zhurnal tekhnicheskoi fiziki*, v. 25, no. 13, Nov. 1955, p. 2329-2335.

Effect of temperature and impurities on electrical conductivity and coefficient of thermal e.m.f. Concentration and mobility of vacancies. Graphs, diagram, tables. 7 ref. (P15, Cd, Te)

100-P. The Heat of Combustion of Samarium. Elmer J. Huber, Jr., Clayton O. Matthews and Charles E. Holley, Jr. *American Chemical Society, Journal*, v. 77, Dec. 20, 1955, p. 6493-6494.

Results from colorimetric combustions of the metal, conducted at an initial temperature of 25° C. under an oxygen pressure of 25 atmospheres. Table. 12 ref. (P12, Sm)

101-P. Heats of Formation of Niobium Carbide and Zirconium Carbide From Combustion Calorimetry. Alla D. Mah and B. J. Boyle. *American Chemical Society, Journal*, v. 77, Dec. 20, 1955, p. 6512-6513.

Results of combustion calorimetric investigations. Table. 5 ref. (P12, Cb, Zr)

102-P. Alloyed-Junction Transistor Development. J. James Ebers. *Bell Laboratories Record*, v. 34, Jan. 1956, p. 8-12.

Production method for triode junction transistors of either the n-p-n or the p-n-p variety by an alloying process. Diagrams, micrograph, photographs, table. 1 ref. (P15, T1, Ge)

103-P. Radiation Effects in Solids. R. Smoluchowski, W. J. Leivo, H. Ingham, K. Kobayashi, P. V. Mitchell, E. A. Pearlstein and W. H. Vaughan. *Carnegie Institute of Technology (U. S. Atomic Energy Commission)*, NYO-7379, Sept. 1955, 9 p.

Measurement of electrical conductivity, density, elastic constants, stored energy and optical absorption on irradiated and nonirradiated nonmetal crystals; energy dependence of radiation effects in metals and alloys; neutron irradiation effects in alpha brass. (P10, P general)

104-P. Mirror Coatings for Low Visible and High Infrared Reflectance. Georg Hass, H. H. Schroeder and A. F. Turner. *Optical Society of America, Journal*, v. 46, Jan. 1956, p. 31-35.

Effect of single and multilayer coatings on the reflectance of metals; description of two multilayer film designs suitable for producing mirror coatings with low visible and high infra-red reflectance. Diagrams, graphs. (P17)

105-P. Surface Resistance and Reactance of Metals at Infrared Frequencies. J. R. Beattie and G. K. T. Conn. *I.R.E., Proceedings*, v. 44, Jan. 1956, p. 78-81.

Behavior of a number of specimens of silver, aluminum, copper and nickel studied in the range 2.5 to 15 x 10^{13} cycles per sec. Graphs, table. 19 ref. (P15, Al, Ag, Cu, Ni)

106-P. On the Thermodynamics of Crystalline Lattices. L. Salter. *Royal Society, Proceedings*, v. 233 ser. A, Dec. 29, 1955, p. 418-427.

Approximate method of evaluating phase-space averages which takes on a simple form in the case of lattices with cubic symmetry. Graphs. 25 ref. (P12, M26)

107-P. Determination of the Vapor Pressure of Metals and Alloys. Rudolph Speiser and J. W. Spretnak. Paper from "Vacuum Metallurgy". Electrochemical Society, Inc., p. 155-191.

Apparatus and procedures used in a number of high and low-pressure methods. Deals with research done since 1950, principally in dynamical experimental procedures. Tables, graphs, diagrams. 65 ref. (P12)

108-P. (Dutch.) **Theoretical Iron Loss of Core-Type Transformers.** C. E. M. de Kuijper. *Smit mededelingen*, v. 10, no. 4, Oct.-Dec., 1955, p. 137-145.

Extensive mathematical development to include core corner losses. Graphs, diagrams. 7 ref. (P16, Fe)

109-P. (French.) **Electrochemical Behavior of Germanium. Voltage-pH Equilibrium Diagram of the Ge-H_2O System at 25° C.** N. de Zoubov, E. Deltombe and M. Pourbaix. *Centre Belge d'Etude de la Corrosion, Rapport Technique*, no. 27, 1955, 21 p.

Free enthalpies of formation at 25° C.; reactions and equilibrium formulas; interpretation of equilibrium diagrams. Diagrams, graph. 42 ref. (P15, P12, L17, Ge)

110-P. (French.) **Hall Effect, Spontaneous Magnetization, and Temperature.** Edgar A. Ascher. *Helvetica Physica Acta*, v. 28, no. 7, Dec. 1955, p. 667-693.

Perrier's theory is applied, assuming that each ferro-magnetic domain is anisotropic toward electrical and thermal conduction. Mathematical expression developed to explain the results. Tables, graphs, diagrams. 34 ref. (P15, P16, P12)

111-P. (German.) **Electrical Properties of the Intermetallic Compounds, Mg_2Si, Mg_2Ge, Mg_2Sn, and Mg_2Pb.** Ulrich Winkler. *Helvetica Physica Acta*, v. 28, no. 7, Dec. 1955, p. 633-666.

Investigation of polycrystalline preparations. Measurements of electric conductivity, Hall constants and thermal force in temperature intervals from 100 to 1100° K. Tables, graphs, diagram. 33 ref. (P15, Mg, Ge, Pb, Si, Sn)

112-P. (Russian.) **Investigation of Magnetic Reversal Nuclei in Ferrosilicon Crystals.** Ia. S. Shur and V. R. Abel's. *Doklady akademii nauk SSSR*, v. 105, no. 3, Nov. 21, 1955, p. 469-471 + 1 plate.

Experimental investigation by means of change in the surface powder shapes. Micrographs. 5 ref. (P16, Fe, Si)

113-P. (Russian.) **Nature of Slow Sorption of Gases by Solid Substances.** M. I. Temkin and N. V. Kul'kova. *Doklady akademii nauk SSSR*, v. 105, no. 5, Dec. 11, 1955, p. 1021-1023.

Three types of sorption processes subdivided according to kinetic and

temperature-range criteria. Mechanism of solubility of oxygen in liquid silver. 15 ref. (P13, Ag)

114-P. (Russian.) Resistivity and Its Variation in a Strong Magnetic Field in the Case of Iron-Nickel Alloys in a Low-Temperature (14-90° K) Range. E. Kondorskii and I. Ozhigov. *Doklady akademii nauk SSSR*, v. 105, no. 6, Dec. 21, 1955, p. 1200-1203.

Relation between resistivity and composition of alloys. Graphs. 3 ref. (P15, Fe, Ni)

115-P. Oxygen Content of Gray Cast Iron Increases With Time. R. C. Williams and H. W. Lownie, Jr. *American Foundrymen's Society, Transactions*, v. 63, 1955, p. 177-179; disc., p. 179-180.

Vacuum-fusion analyses showed that oxygen content of gray cast iron increases with time. Amount of oxygen absorbed and the absorption rate is determined by the structure of the graphite flakes on the surface of the iron. Micrographs, photograph, graph. 8 ref. (P13, P10, S11, Cl,)

116-P. The Electrical Resistance of Thorium Through the Allotropic Transition. Herbert W. Deem and Robert A. Winn. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, BMI-1052, Nov. 1955, 8 p.

The electrical resistance-temperature curve of thorium exhibits a reversible inflection at about 1400° C., corresponding with the allotropic transition in this vicinty. Resistance data indicate that such impurities as carbon, nitrogen and oxygen raise the transformation temperature. Diagram, graphs, table. 6 ref. (P15, N6, Th)

117-P. Pressure Dependence of the Resistivity, Hall Coefficient, and Energy Gap for InAs. Julius H. Taylor. *Physical Review*, v. 100, ser. 2, Dec. 15, 1955, p. 1593-1595.

Experimental results of hydrostatic pressure on the resistivity, Hall coefficient and energy gap for *n*-type polycrytalline indium arsenide. Graph, table. 3 ref. (P15, In, As)

118-P. Magnetic Properties of Erbium Metal. J. F. Elliott, S. Legvold and F. H. Spedding. *Physical Review*, v. 100, ser. 2, Dec. 15, 1955, p. 1595-1596.

Measurements of the magnetic moment of erbium metal in the temperature range from 20.4 to 90° K. The initial susceptibility shows a maximum at 78° K. and the metal appears to become ferromagnetic near 20° K. Graphs. 12 ref. (P16, Er)

119-P. Properties of Indium and Thallium at Low Temperatures. C. A. Swenson. *Physical Review*, v. 100, ser. 2, Dec. 15, 1955, p. 1607-1614.

Pressure-volume relationships for indium and thallium near absolute zero were observed; data were compared with theories which attempt to explain the variation of the superconducting transition temperature with pressure. Graphs, tables. 25 ref. (P15, In, Tl)

120-P. Fast-Neutron Bombardment of GaSb. J. W. Cleland and J. H. Crawford, Jr. *Physical Review*, v. 100, ser. 2, Dec. 15, 1955. p. 1614-1618.

Effect of reactor irradiation on the conductivity of shielded and unshielded samples. Graphs, table. 16 ref. (P15, P10, Ga, Sb)

121-P. Amphoteric Impurity Action in Germanium. W. Crawford Dunlap, Jr. *Physical Review*, v. 100, ser. 2, Dec. 15, 1955, p. 1629-1633.

The existence of a third state in gold is confirmed, and it is shown, with rather high degree of certainty, to be a donor level 0.05 ev. above the valence band. Diagram, graphs, table. 4 ref. (P15, Au, Ge)

122-P. Carrier Capture Probabilities in Nickel Doped Germanium. J. F. Battey and R. M. Baum. *Physical Review*, v. 100 ser. 2, Dec. 15, 1955, p. 1634-1637.

Explanation of similar phenomena occuring in nickel-doped and copper-doped germanium and interpretations of results of experiments. Graphs, tables. 7 ref. (P15, Ni, Ge)

123-P. Statistics and Galvanomagnetic Effects in Germanium and Silicon With Warped Energy Surfaces. Benjamin Lax and J. G. Mavroides. *Physical Review*, v. 100, ser. 2, Dec. 15, 1955, p. 1650-1657.

A method for carrying out calculations of the statistical properties and the galvanomagnetic effects of germanium and silicon which is valid for weak magnetic fields and takes anisotropy into account. Graphs, table. 29 ref. (P15, P16, Ge, Si)

124-P. Hall Effect and Conductivity of InSb. H. J. Hrostowski, F. J. Morin, T. H. Gaballe and G. H. Wheatley. *Physical Review*, v. 100, ser. 2, Dec. 15, 1955, p. 1672-1676.

Semiconducting properties were determined at 1.3 to 700° K. from measurements of Hall coefficient and conductivity on single-crystal samples of low impurity content. Graphs, table. 19 ref. (P15, In, Sb)

125-P. Thermal Conductivity of Indium-Thallium Alloys in the Normal and Superconducting States. Norman E. Phillips. *Physical Review*, v. 100, ser. 2, Dec. 15, 1955, p 1719-1725.

Thermal conductivity measurements at temperatures below 1° K. Data are interpreted as meaning that thonon conductivity limited by boundary scattering is important in this region. Diagram, graphs. 18 ref. (P11, In, Tl)

126-P. An Adiabatic Specific Heat Calorimeter for the Range 15 to 290° C. W. E. Wallace, R. S. Craig and W. V. Johnston. *University of Pittsburgh (U. S. Atomic Energy Commission)*. NYO-6328, Oct. 1955 16 p.

Designed for intermittent heating so that the specific heat characteristic of the sample in an equilibrium state is obtained. Precision of the order of 0.1 to 0.2% is attained over the entire temperature range. Diagrams, table. 7 ref. (P12)

127-P. (English.) The Specific Heat of Solids. M. Blackman. Paper from "Handbook of Physics". v. VII. Pt. I. "Crystal Physics". Pt. I. Springer-Verlag, p. 325-382.

Lattice theory, calculation of velocity of crystal waves, vibrational spectra and lattic vibrations. Graphs, diagrams, tables. 29 ref. (P12)

128-P. (English.) On the Theory of Superconductivity. V. L. Ginzburg. *Nuovo cimento*, v. 2, ser. 10, no. 6, Dec. 1955, p. 1234-1250.

Macroscopic theory and superconductor behavior in weak high-frequency fields. Problems of formulating a microscopic theory considered. 30 ref. (P15)

129-P. (German.) Results of Low-Temperature Investigations. XV. Determination of Electronic Heat in Metals. XVI. Atomic and Electronic Heat of Tantalum Between 10 and 273° K. Klaus Clusius, Hans Heinrich Bühler and Celso Gutierrez Losa. *Zeitschrift für Naturforschung*, v. 10a, no. 12, Dec. 1955, p. 930-943.

Measurements of electrons and atomic heat capacities at very low temperatures. Determinations made on Ag, Cu, Al, Mg, Tl, Zr, V, U and Ta. Graphs, tables. 5 ref. (P12, Ag, Cu, Al, Mg, Tl, Zr, V, U, Ta)

130-P. (German) Magneto-Elastic Properties of Certain Ferromagnetic Iron-Nickel Alloys. R. Ochsenfeld. *Zeitschrift für Physik*, v. 143, no. 4, 1955.

The delta-E effect depends not only on magnetizing conditions but on the magnetic reversal which is automatically produced during the experiment. Tables, graphs. 12 ref. (P16, Fe, Ni)

131-P. (Russian.) Surface Resistivity of Tin in Superconductive State at a Frequency of $7.3X10_9$ Cycles. P. A. Bezuglyi, A. A. Galkin and G. Ia. Levin. *Daklady akademii nauk SSSR*, v. 105, no. 4, Dec. 1, 1955. p 683-684.

Temperature relation and anomalies of curves for high-frequency resistance. Graphs. 5 ref. (P15, Sn)

132-P. (Russian.) Crystal Chemistry of Oxide Compounds of Vanadium, Tungsten and Molybdenum. R. P. Ozerov. *Uspekhi khimii*, v. 24, no. 8, 1955, p. 951-984.

Structures, crystal classifications and distances between atoms. Preparation and electroconductive, catalytic and magnetic properties of tungsten and vanadium bronzes.. Diagrams, tables, graphs. 123 ref. (P15, P16, M26, Mo, V, W)

133-P. (Book.) Abstracts of the Literature on Semiconducting and Luminescent Materials and Their Applications. 200 p. 1954. John Wiley & Sons, 440 Fourth Ave., New York 16, N. Y. $5.00.

A collection of over 750 informative abstracts emphasizing the properties and applications of the most common elements, in addition to the intermetallics, oxides, sulfides, halides, and organics; fluorescence and phosphorescence; and theory. (P15)

Q

Mechanical Properties and Test Methods; Deformation

118-Q. A Remotely Operated Extensometer. R. G. Berggren and J. C. Wilson. *ASTM Bulletin*, 1955, no. 210, Dec., p. 35-38; disc., p. 38.

Sensitive instrument developed for use in tension testing of highly radio-active metallic specimens. Design, operation, and advantages. Diagrams, photograph. 2 ref. (Q27)

119-Q. Tensile Stripping Tests on B.S.W. ¾ In.10 T.P.I. Threads. J. E. Field. *Engineer*, v. 200, Dec. 23, 1955, p. 901-902.

Static stripping tests carried out on high-tensile steel bolts and nuts, high-tensile bolts with mild steel nuts and on low-tensile steel bolts with high-tensile nuts to determine the relationship between nut height and stripping strength of assemblies. Diagram, graph, tables. (Q27, AY)

120-Q. Tensile Properties of Some Titanium Ternary Solid Solutions and Duplex Alloys Up to 600° C. J. W. Suiter. *Institute of Metals, Journal*, v. 84, Dec. 1955, p. 81-83 + 1 plate.

Ternary solid solutions followed the same general pattern as for the binary solutions, in that strength decreases rapidly up to 300° C., remains almost constant between 350 and 500° C., and decreases rapidly at high temperatures. Graphs, 4 ref. (Q27, Ti)

121-Q. The Relationship Between The First Development of Slip Lines and Metallographic Slip-Line Indications in 70:30 Brass. L. E. Samuels and M. Hatherly. *Institute of Metals. Journal*, v. 84, Dec. 1955, p. 84-86 + 1 plate.

Experimental technique has shown that a small but definite amount of shear must have occurred on a slip-line in the brass before a metallographic slip-line indication could be developed at its trace by the most sensitive etching methods. 11 ref. (Q24, Cu)

122-Q. The Mechanism of Embrittlement by a Liquid Phase. R. Eborall and P. Gregory. *Institute of Metals, Journal,* v. 84, Dec. 1955, p. 88-90 + 1 plate.

Experimental data on the spread of a liquid phase over the boundaries of a metal in the absence of stress. Graphs, table. 8 ref. (Q26, Q23, Pb, Cu, Sn, Zn)

123-Q. On the Plastic Flow of Metals Under Conditions of Axial Symmetry. R. T. Shield. *Royal Society, Proceedings,* v. 233, ser. A, Dec. 20, 1955, p. 267-287.

Axially symmetric plastic flow of a rigid-plastic nonhardening material which obeys the Tresca yield criterion of constant maximum shearing stress and the associate flow rule. Diagrams, graphs, tables. 17 ref. (Q24)

124-Q. What You Can Do About Metal Fatigue. Allen G. Gray. *Steel,* v. 138, Jan. 16, 1956, p. 68-72.

Precautionary measures to prevent fatigue failure, reasons for metal fatigue and pointers which may be used in fatigue testing. Graphs, photographs. (Q7)

125-Q. (Czech.) Stresses in Reinforced Sheet or Plate. V. Placak. *Strojirenstvi,* v. 5, no. 9, Sept. 1955, p. 643-651.

Calculation of bending and twisting stresses in infinitely long plates strengthened by variously shaped ribs or braces. Equations for internal and external deformation work and forces. Critical shear stress. Diagrams, photographs. 18 ref. (Q25, Q24, Q2)

126-Q. (Czech.) Statistical Theory of the Fatigue of Material. J. Sedlacek. *Strojirenstvi,* v. 5, no. 11, Nov. 1955, p. 859-863.

Determination of slope, shape and other parameters of curves graphically and analytically. Graphs, table. 9 ref. (Q7)

127-Q. (French.) Description of a Universal Apparatus for Elastic Damping of Metals. Applications to Aluminium. H. J. Seemann. *Revue de métallurgie,* v. 52, no. 11, Nov. 1955, p. 864-868.

Equipment to gage elastic damping capacity of metals over a spread of frequency, temperature and deformation amplitude applied to 99.997% aluminum. Graphs, diagrams. 6 ref. (Q8, Al)

128-Q. (Russian.) Effect of Tempering on the Hardness of a Surface Layer Hardened by the Electrospark Method. G. P. Ivanov, V. A. Belianin and V. V. Borisova. *Metallovedenie i obrabotka metallov,* no. 4, Oct. 1955, p. 48-51.

Effect of electrode material (chromium, tungsten, ferrochromium) and tempering temperature on properties of the hardened layer. Graphs, table. 5 ref. (Q29, J29, G17, ST)

129-Q. (Russian.) Methods of Calculating Tendency of Steel to Brittle Fracture in Welded Storage Tanks. A. S. Fal'kevich, L. S. Livshits and S. I. Panich. *Svarochnoe proizvodstvo,* no. 12, Dec. 1955, p. 8-10.

Temperature and other conditions under which welded oil tanks develop brittle state and cracking. Critical temperature of brittleness in relation to impact strength, before and after aging. Tables, diagrams, micrograph, photograph. 4 ref. (Q26, Q6, K1, K2, ST)

130-Q. (Russian.) Formation of Cracks in Welded Constructions. G. A. Nikolaev. *Svarochnoe proizvodstvo,* no. 12, Dec. 1955, p. 1-4.

Analysis of cracks caused by fatigue and residual stresses. (Q25, Q7, K9, ST)

131-Q. (Russian.) Nonlinear Equations for Creep and Relaxation of Materials in Complex Stressed State. M. I. Rozovskii. *Zhurnal tekhnicheskoi fiziki,* v. 25, no. 13, Nov. 1955, p. 2339-2354.

Relation of instantaneous modulus of elasticity to degree of deformation. Relation of relaxation time to stress. 14 ref. (Q3)

132-Q. A 600-Ton Test Rig for Brittle Fracture Research. A. A. Wells. *British Welding Journal,* v. 3, Jan. 1956, p. 25-30.

Development of special rig using hydraulic capsules for intermediate tests on brittle fracture. Information on stress distribution and structural strength, capsule assemblies, hydraulic system, stability under load, load and extension records, test plate cooling, conditions at fracture, trials. Diagrams, graphs, photograph. 2 ref. (Q26, ST)

133-Q. A Model of Mechanical Behavior Evaluated With Creep Tests Applied to Alpha Uranium. K. R. Merckx. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission),* HW-40494, Nov. 1955, 17 p.

Behavior of uranium in the temperature range of 100 to 300° C., considers the stress, strain, time and temperature dependence of strain rate. Parameters of the model evaluated with creep tests; method must be modified in the higher temperature ranges. Graphs. 10 ref. (Q3, U)

134-Q. On the Thermal Aspect of Fatigue. A. M. Freudenthal and J. H. Weiner. *Journal of Applied Physics,* v. 27, Jan. 1956, p. 44-50.

Attempt to explain phenomenon of progressive deterioration of the strength of metals and alloys due to the action of repeated load cycles. Diagrams, micrograph. 24 ref. (Q7)

135-Q. Experimental Test of the Theory of Penetration by Metallic Jets. R. J. Eichelberger. *Journal of Applied Physics,* v. 27, Jan. 1956, p. 63-68.

Measurement of jet and penetration velocities as functions of depth of penetration for lined cavity charges fired into several types of target material under a variety of experimental conditions. Diagram, graphs. 7 ref. (Q general)

136-Q. Final Report Joint AEC-ASME Program on Thermal Stress Fatigue. L. F. Coffin, Jr. *Knolls Atomic Power Laboratory (U. S. Atomic Energy Commission),* KAPL-1411, Sept. 1955, 60 p.

Results of investigation on thermal cycling to produce tensile stresses at the higher temperature end of the thermal cycle rather than compression, and on the independent variation of strain and temperature amplitude. Graphs, diagrams, photographs. (Q7, SS)

137-Q. Why Specify Ductility? W. K. Bock. *Machine Design,* v. 28, Jan. 12, 1956, p. 133-136.

An analysis of the practical significance of ductility as a material property. Diagram, graphs. 4 ref. (Q23)

138-Q. Approximate Strength of Jet Engine Alloys After Optimum Treatment. *Metal Progress,* v. 69, Jan. 1956, p. 96B.

Data sheet with reference to temperature, tensile test, stress-rupture. (Q23, Q27, Q4, SG-h)

139-Q. Wear of Metals by Sand Erosion. Werner A. Stauffer. *Metal Progress* v. 69, Jan. 1956, p. 102-107.

A 15-hr. test is able to determine sand erosion of various constructional materials to ±5% reproducibility and the results correlate with experience on hydraulic turbines. Diagram, graphs, photographs, tables. (Q9)

140-Q. The Role of Thin Surface Films in the Deformation of Metal Monocrystals. John J. Gilman. Paper from "Symposium on Basic Effects of Environment on the Strength, Scaling, and Embritlement of Metals at High Temperatures". ASTM Special Technical Publication No. 171, p. 3-11; disc., p. 11-13.

Review of the literature on the strengthening effects of surface films on monocrystals. New data confirm the viewpoint that strengthening effects cannot be explained in terms of the film itself. Graphs, table, X-ray spectra. 27 ref. (Q23, Q24, Zn, Cd)

141-Q. Impact Properties of Vacuum-Melted Iron-Chromium Alloys. John L. Ham and Frank L. Carr. Paper from "Vacuum Metallurgy". Electrochemical Society, Inc., p. 35-48.

Compares impact properties of vacuum-melted with air-melted alloys. Charpy transition temperature and impact energy level determined for pure iron and for various iron-chromium alloys containing from 12 to 49% chromium. Graphs, tables. 12 ref. (Q6, Fe, Cr)

142-Q. Effect of Initial Structure on Development of Temper Brittleness. T. V. Sergievskaya. *Henry Brutcher Translation No.* 3597, 15 p. (From *Stal,* v. 15, no. 1, 1955, p. 63-68.) Henry Brutcher, Altadena, Calif.

Manganese steel 45G2 develops brittleness with after-temperature or with temper embrittlement at 550° C. Brittleness tendency is least in a structure of pearlite in a ferrite matrix. Tables, graphs, photographs, micrographs. 4 ref. (Q23, J29, AY)

143-Q. (French.) A New Class of Light Materials: Semi-Products Obtained From Oxidized and Sintered Aluminum. J. Boghen and J. Hérenguel. *Technique et science aéronautiques,* 1955, no. 5, p. 292-296.

Study of mechanical properties measured at 20° C., and their creep behavior. Graphs. 8 ref. (Q general, H general, Al)

144-Q. (German.) Strain Hardening in Tensile Test. Alfred Krisch. *Archiv für das Eisenhüttenwesen,* v. 26, no. 12, Dec. 1955, p. 761-767.

Investigation on different types of German steels. Micrographs, graphs, tables. 9 ref. (Q27, ST)

145-Q. (German.) Nature and Application of Microhardness. II. H. Bückle. *Metall,* v. 9, nos. 23-24, Dec. 1955, p. 1067-1074.

Laws of microhardness and their utilization. Graphs, diagrams, micrographs. 35 ref. (Q29)

146-Q. (Italian.) Statistical Interpretation of Fatigue Tests. F. Gatto. *Alluminio,* v. 24, no. 6, Nov.-Dec. 1955, p. 543-554.

Statistics applied to show applications, limitations, possible improvements. Graphs. 21 ref. (Q7)

147-Q. (Italian.) Application of Statistical Analysis for the Interpretation of Fatigue Test Data. F. Gatto. *Alluminio,* v. 24, no. 6, Nov.-Dec. 1955, p. 555-560.

Results show that rearrangement of points permits accurate determi-

nation of the average trend; the vertical dispersion of fatigue points appears to be of normal type and of particularly constant amplitude. Tables, graphs. (Q7)

148-Q. (Russian.) **Nature of Temper Brittleness of Steel.** A. I. Rizol', L. G. Sakvarelidze and L. M. Utevskii. *Doklady akademii nauk SSSR*, v. 105, no. 2, Nov. 11, 1955, p. 268-270 + 1 plate.

Sensitivity of steel to temper brittleness determined by solubility of carbon in ferrite in the range of 700 to 400° C., the composition and state of intercrystalline transitional zones and the size of the original austenitic grain. Micrographs. 14 ref. (Q23, ST)

149-Q. (Russian.) **Dislocation Theory of Metal Fatigue.** I. A. Oding. *Doklady akademii nauk SSSR*, v. 105, no. 6, Dec. 21, 1955, p. 1238-1240.

Decisive factor for fatigue phenomenon is intensity of formation of vacancies. Higher concentration of vacancies aggravates processes of coagulation and settling. Graph. 3 ref. (Q7, M26)

150-Q. (Russian.) **Intercrystalline Strength of Metals During Welding.** N. N. Prokhorov. *Izvestiia akademii nauk SSSR, otdelenie tekhnicheskikh nauk*, no. 11, Nov. 1955, p. 34-49.

Relation between deformation rate and plasticity of metals. Stages of fracture or failure in relation to temperature. Graphs, diagrams, micrographs. 2 ref. (Q26, Q24, K9)

151-Q. (Russian.) **Inertia of Plastic Deformation of Steel.** Ernst J. Giessmann. *Izvestiia akademii nauk SSSR, otdelenie tekhnicheskikh nauk*, no. 11, Nov. 1955, p. 50-57.

Tensile testing at high rates reveals anomalies of elongation associated with inertia of propagation of plastic deformation. Amplitudes of waves of plastic deformation of steel with and without heat treatment. Graphs, tables, diagram. 3 ref. (Q24, Q27, ST)

152-Q. (Russian.) **Local Development of Plastic Deformations in Low-Carbon Steels.** V. I. Trofimov. *Izvestiia akademii nauk SSSR, otdelenie tekhnicheskikh nauk*, no. 11, Nov. 1955, p. 58-61.

Varying character of plastic deformation in various portions of test pieces subject to tensile stress, extensions of areas affected. Table, graphs. 3 ref. (Q24, Q27, CN)

153-Q. (Russian.) **Scale Factor in Connection With Determining the Strength of Metals and the Design of Machine Parts.** G. V. Uzhik. *Izvestiia akademii nauk SSSR, otdelenie tekhnicheskikh nauk*, no. 11, Nov. 1955, p. 109-121.

Nonhomogeneity of materials is an important factor in strength of parts much larger than those of the same relative proportions tested in the laboratory. Relation of hardness, yield point and other tests of large pieces to the same tests with smaller pieces of the same proportions and material. Graphs, diagrams, tables, photograph. 17 ref. (Q23, Q29, CN, AY)

154-Q. (Russian.) **Resistance of Carbon Steels to Abrasive Wear.** A. A. Soroko-Novitskaia and M. M. Khrushchov. *Izvestiia akademii nauk SSSR, otdelenie tekhnicheskikh nauk*, no. 12, Dec. 1955, p. 35-47.

Laboratory testing methods for hardness and wear resistance of steels after various heat treatments. Effect of carbon content. Graphs, tables, diagram. 8 ref.
(Q9, Q29, J general, CN)

155-Q. (Russian.) **Inverse Problems of Applied Theory of Plasticity and Carrying Capacity of Structures, the Material of Which Is Characterized by Hardening.** R. A. Mezhlumian. *Izvestiia akademii nauk SSSR, otdelenie tekhnicheskikh nauk*, no. 12, Dec. 1955, p. 80-95.

According to given deformed or stressed state, possible combinations of external loading that cause given state in the structure are determined. Stresses allowed for include bending, torsion, tangential, and others. Diagrams, graphs, tables. 13 ref. (Q24, Q25)

156-Q. (Russian.) **Mechanical Properties and Microstructure of Steels 25L and 20L in Relation to Heat Treatment.** E. P. Ivaniushin and K. N. Kulikova. *Liteinoe proizvodstvo*, no. 11, Nov. 1955, p. 1-4.

Effect of variations in annealing time and temperature. Micrographs, graphs. 8 ref.
(Q general, M27, J23, CI)

157-Q. (Russian.) **Fatigue Strength of Crankshafts Made of Nodular Cast Iron and Steel, With Case-Hardened Journals.** I. V. Kudriavtsev and N. A. Balabanov. *Liteinoe proizvodstvo*, no. 11, Nov. 1955, p. 15-17.

Chemical composition of steel and of ferritic spheroidal cast irons used. Comparison of mechanical properties of crankshafts of both materials. Tables, diagrams, graphs, photographs. 6 ref. (Q7, CI, CN)

158-Q. (Russian.) **Experimental Investigation of the Strength of Equipment in Heavy Machinery Construction.** B. A. Morozov. *Vestnik mashinostroeniia*, v. 35, no. 12, Dec. 1955, p. 18-24.

Uses models of mining and metallurgical machine parts to show distribution of stresses under operational conditions. Diagrams, photographs. 4 ref. (Q25, Q23)

159-Q. (Russian.) **Change in Hardness of Friction Surface of Engine Cylinders During Breaking-In.** L. A. Dem'ianov and B. A. Kolobovnikov. *Vestnik mashinostroeniia*, v. 35, no. 12, Dec. 1955, p. 28-29.

Rate and depth of hardening, time, load, lubrication and wear factors. Relation between breaking-in rate and service life of parts. Graphs, micrograph, diagram, 3 ref.
(Q29, Q9)

160-Q. (Russian.) **Abrasive Wear Resistance of Cold-Worked Metals and Alloys.** M. M. Khrushchov and M. A. Babichev. *Vestnik mashinostroeniia*, v. 35, no. 12, Dec. 1955, p. 38-41.

Relation of hardness to plastic deformation. Test results for bronzes, steels and pure metals with and without cold working, and with variations of prior heat treatment. Relative wear resistance and hardness after heat treatment and plastic deformation.
(Q9, Q29, Q24, AY, Cu, Al, Ni)

161-Q. (Russian.) **Wear Resistance After Electrospark Hardening.** N. P. Pan'kov. *Vestnik mashinostroeniia*, v. 35, no. 12, Dec. 1955, p. 41-44.

Depth of surface hardened, graphite increase in surface from graphite electrode; other factors. Nature of wear and amount of protection afforded by this method. Table, graphs, photographs.
(Q9, J28, ST, CI)

162-Q. (Russian.) **Study of the Mechanical Properties of Heat Treated Toolsteel.** Z. M. Koniushko. *Vestnik mashinostroeniia*, v. 35, no. 12, Dec. 1955, p. 47-51.

Modulus of elasticity during tension and compression; testing methods to accommodate difficulties connected with high strength and low plasticity. Tables, diagrams, graph, photographs. 4 ref. (Q21, Q23, TS)

163-Q. (Russian.) **Determination of Endurance Limit of Spring Steel When Contact Stresses are Present.** A. F. Buinov, V. P. Braichev, I. G. Parkhilovskii and D. A. Sveshnikov. *Vestnik mashinostroeniia*, v. 35, no. 12, Dec. 1955, p. 51-55.

Surface condition and types of break. Relation between number of cycles and moment of tightening. Graphs, diagrams. 4 ref.
(Q7, CN, SG-b)

164-Q. Column Tests on Some Proposed Aluminium Standard Structural Sections. R. E. Smith. *Aluminium Development Association, Research Report No.* 28, Nov. 1955, 43 p.

Determination of behavior of sections when loaded in axial compression on equal and unequal bulb angles, lipped channels and lipped H-sections, for the purpose of producing more efficient aluminum designs. Diagrams, graphs, photographs, tables. 9 ref. (Q28, Al)

165-Q. Effects of Some Melting Variables on Properties of Malleable Iron. G. E. Kempka and R. W. Heine. *American Foundrymen's Society, Transactions*, v. 63, 1955, p. 19-33; disc., p. 33-34.

Experimental research results. Tables, graphs, photographs. 6 ref. (Q27, E10, CI)

166-Q. Tensile Property Evaluation of Shell-Mold-Cast Versus Green-Sand-Cast Magnesium Alloy Test Bars. Nicholas Sheptak. *American Foundrymen's Society, Transactions*, v. 63, 1955, p. 157-162; disc., p. 162.

Includes tables, 6 ref.
(Q27, E16, Mg)

167-Q. Influence of Core Making Materials on Development of Hot Tears. C. H. Wyman. *American Foundrymen's Society, Transactions*, v. 63, 1955, p. 203-208.

Progress has been made in obtaining a design for a test casting to evaluate factors influencing hot tear formation in steel casting and in isolating certain factors contributing to the formation. These factors were inherent to specific heat cast design, to resistance of internal test cores, to pouring techniques and to metal poured. Graphs, tables.
(Q23, E21, ST)

168-Q. Metallurgical Examination of Hot Tears in Steel Castings. L. L. Clark. *American Foundrymen's Society, Transactions*, v. 63, 1955, p. 208-216.

Strongest factor to influence hot tearing is the core material. The deoxidation practice used appears to exert a definite influence on the rate of tearing. Tables, micrographs. (Q23, E general, ST)

169-Q. Pearlitic Malleable Iron—Interrelation of Heat Treatment, Mechanical Properties and Machinability. John E. Kruse. *American Foundrymen's Society, Transactions*, v. 63, 1955, p. 244-250.

Mechanical properties are dependent upon structural constitutents. A relationship between microstructure and hardness permits the prediction of mechanical properties. Oil-quenched and drawn pearlitic malleable has a higher yield strength and greater elongation than air-cooled and drawn pearlitic. Machinability appears to be a function of yield strength. Tables, graphs, micrographs. 6 ref.
(Q general, M27, G17, CI)

170-Q. Effects of Molybdenum on Stability and High-Temperature Properties of Pearlitic Malleable Iron. W. G. Scholz, D. V. Doane and G. A. Timmons. *American Foundrymen's Society, Transactions*, v. 63, 1955, p. 251-260.

Molybdenum-alloyed pearlitic malleable iron parts can function under

stress at elevated temperatures appreciably higher than those practical for unalloyed iron. Micrographs, tables, graphs. (Q general, CI)

171-Q. Short-Time Elevated Temperature Properties of Three Copper-Base Casting Alloys. J. O. Edwards. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 267-269; disc., p. 269-270.

The data obtained suggest that the addition of nickel to copper-base alloys imparts improved strength at elevated temperatures. Graphs, diagram, tables. 6 ref. (Q27, Cu)

172-Q. High Temperature Impact Properties of Cast Steel. C. F. Christopher. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 480-487; disc., p. 487.

The hot tearing range in steels is dependent upon the liquidus-solidus relationship which determines the degree of heterogeneous selective freezing. Elimination of hot tearing depends on pouring temperature, which sets up a stress, and chilling, which eliminates or dissipates the stress. Photographs, tables, graphs. (Q6, CI)

173-Q. Foundry Characteristics and Properties of Magnesium Sand Casting Alloy HZ32XA. K. E. Nelson. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 596-605; disc., p. 606.

Production castings of alloy HZ32-XA were poured and tested for foundry defects. Tensile properties at room temperature and tensile and creep properties at elevated temperatures were determined. The thorium-containing alloy is inferior on the basis of castability and superior in creep resistance. Photographs, tables, graphs. 12 ref. (Q general, E11, Mg)

174-Q. A Metallographic Study of Ruptures in Steel Castings. J. B. Caine. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 615-630; disc., p. 630-631.

Fundamental high-temperature rupture-causing processes, as an aid in diagnosing service and processing failures. Micrographs. 3 ref. (Q26, M21, CI)

175-Q. Nickel Austenitic Ductile Irons. F. G. Sefing. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 638-641; disc., p. 641.

Physical and mechanical properties from commercial laboratory data. Micrographs, tables. (Q general, P general, CI)

176-Q. Mechanical Properties of Cast Titanium-Silicon Alloys. H. W. Antes and R. E. Edelman. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 662-668; disc., p. 668.

Tests results for 14 alloys. Diagrams, table, graphs, photographs, micrographs. 9 ref. (Q general, Ti)

177-Q. Embrittlement, Toughening and Subcritical Thermal Treatment of Malleable Iron. G. E. Kempka. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 675-681; disc., p. 682.

Clarifies principles involved in embrittlement and its prevention, with respect to chemical composition and subcritical thermal treatment, and shows that the strength level of an iron may be raised or lowered by such treatments. Micrographs, photographs, graphs, tables. 13 ref. (Q23, Q6, Q27, J general, CI)

178-Q. Use of Experimental Stress Analysis as a Casting Design Tool. Joe W. Beckham. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 732-735.

Use of stress data to design and redesign parts to be cast. Photographs. (Q25, E general)

179-Q. Mechanical Properties of Aluminum Alloy Castings. Roy E. Paine and W. D. Stewart. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 745-750; disc., p. 750-751.

Importance of design factors on mechanical properties obtained, relationship between mechanical properties of test bars and the actual casting, and metallurgical properties affecting mechanical properties. Diagram, graphs, tables, photographs. 6 ref. (Q general, E general, Al)

180-Q. The Tensile Strength of Brazed Stainless Steel Joints. H. A. Saller, J. T. Stacy and H. L. Klebanow. *Battelle Memorial Institute (U. S. Atomic Energy Commission),* AECD-3696, July 1953, 15 p.

Effects of temperature, joint clearance and annealing on the tensile strength of Type 310 stainless steel T-joints brazed with 62 brazing alloys were investigated. At room temperature, joints with zero clearances were the strongest for all conditions, the strength falling off rapidly up to 0.002-in. clearance. At elevated temperatures, the tensile strengths were independent of joint clearances. Graphs, diagrams, table, micrographs. (Q27, K8, SS)

181-Q. The Application of a New Structural Index to Compare Titanium Alloys With Other Materials in Airframe Structures. L. R. Jackson and S. A. Gordon. *Battelle Memorial Institute, Titanium Metallurgical Laboratory Report No.* 24, Dec. 1955, 30 p.

Alloy comparison is on basis of ultimate tensile strength and crippling strength of columns. Index is compared with room-temperature compression tests on aluminum sections and tests on titanium alloy angles and channels at room and elevated temperatures. Diagrams, graphs, tables. (Q27, Q28, Ti)

182-Q. The Wear of Cast Iron Machine Tool Slides, Shears and Guideways. H. T. Angus, D. Marles and M. H. Hillman. *British Cast Iron Research Association. Journal of Research and Development,* v. 6, Dec. 1955, p. 72-135 + 7 plates.

Results of an extensive survey of the slides of some 30 machine tools. A case history of each examination, including operating details, analysis, hardness, photographs and photomicrographs. Graph, micrographs, photographs, table. 7 ref. (Q9, CI)

183-Q. The Fracture of Brittle Chromium by Acid Etching. W. H. Smith. *Electrochemical Society, Journal,* v. 103, Jan. 1956, p. 51-53.

Hydrogen embrittlement of chromium is believed to be caused by the formation of face-centered cubic chromium hydride on the surface. Room temperature ductile material seems to show no embrittling effect. Photographs. 8 ref. (Q23, M27, Cr)

184-Q. Temperature Dependence of Hardness of the Equi-Atomic Iron Group Aluminides. J. H. Westbrook. *Electrochemical Society, Journal,* v. 103, Jan. 1945, p. 54-63.

Up to 800° C., FeAl, CoAl and NiAl-based materials show higher intrinsic hardness than pure metals. Graphs, tables, phase diagrams, micrographs. 38 ref. (Q29, Fe, Al, Co, Ni, Ti)

185-Q. Photoelasticity for Design Improvement. I. W. Smith. *Engineering Journal,* v. 39, Jan. 1956, p. 15-24; disc., p. 34-36.

Photoelastic techniques which may be used singly or in combination to solve certain stress problems not readily solved by mathematical formula. Various applications and value of the method to the design engineer. Micrographs, photographs, diagram, table. 67 ref. (Q25)

186-Q. The Effect of Irradiation on the Mechanical Properties of Arc-Melted Bureau of Mines Zirconium With Various Degrees of Cold Work. R. S. Kemper, Jr., and W. S. Kelly. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission),* HW-38079 July 1955, p. 4-32.

Effects of cold working and neutron irradiation on the tensile properties and hardness of zirconium produced by the Kroll process. Irradiation increased the hardness and yield strength in annealed material but the effect decreased with increasing levels of cold work. Diagrams, tables, photographs, micrographs. 16 ref. (Q23, Q29, Zr)

187-Q. Effects of Temperature and Radiation Upon the Tensile and Impact Properties of ASTM-A302-B Manganese-Molybdenum Steel. E. E. Baldwin. *Knolls Atomic Power Laboratory (U. S. Atomic Energy Commission),* KAPL-1416, Oct. 1955. 58 p.

Tensile and impact specimens were fabricated, canned, charged into the Brookhaven reactor and irradiated to an integrated fast neutron flux of 3.7×10^{18} nvt. at 500 and 700° F. Diagrams, graphs, micrographs, tables. (Q6, Q27, Mg, Mo)

188-Q. Theory and Application of Sliding Contact of Metals in Sodium. L. F. Coffin, Jr. *Knolls Atomic Power Laboratory (U. S. Atomic Energy Commission),* KAPL-828, Oct. 1955, 17 p.

Performance of thrust-bearing combinations of various metals in liquid sodium. Mechanism of wear and surface damage. Graphs, micrographs. 5 ref. (Q9, Na)

189-Q. Failures in Titanium Parts. *Metal Industry,* v. 88, Jan. 20, 1956, p. 47-48.

Failures due to hydrogen inclusion. Results of tests to determine maximum percent of hydrogen that could be left in commercially pure titanium sheet and still avoid chances of failure of formed parts. Graphs. (Q23, Q26, Ti)

190-Q. Mechanical Strength of Thin Films of Metals. J. W. Beams, J. B. Breazeale and W. L. Bart. *Physical Review,* v. 100, ser. 2, Dec. 15, 1955, p. 1657-1661.

Films are electrodeposited on the complete cylindrical surfaces of small steel rotors and the rotor speeds necessary to throw them off are determined. The tensile strength and the adhesion of the films are obtained by using rotors of different radii. Diagrams, graphs. 13 ref. (Q27, L17, Ag)

191-Q. The Engineering Application of the Absolute Rate Theory to the Creep of Lead. Mervin B. Hogan. *University of Utah, Engineering Experiment Station, Bulletin No.* 75, v. 46, no. 17, Nov. 1955, 82 p.

Metallurgical complexity of lead and the influence of alloying elements and other factors upon its mechanical properties. Diagrams, graphs, tables. 35 ref. (Q3, Pb)

192-Q. (French.) **Comparison of the Elastic and Mechanical Properties of Gray and Nodular Cast Irons.** Raymond de Fleury. *Fonderie,* 1955, no. 119, Dec., p. 4817-4820.

Rules and examples for calculating the modulus of elasticity of a compound in the case of a stratified or fibrous structure. Table. (Q21, CI)

193-Q. (French.) **Method and Apparatus for the Immediate Separation of Stresses in Oblique Polarized Light.**

Paul Acloque. *Revue d'optique*, v. 34, no. 11, Nov. 1955, p. 553-574.

Oblique polarized light with fixed incidence provides the azimuth of the plane of incidence and the angle of incidence. These values are then used to determine principal stresses. Table, graph, diagrams, polarograms. (Q25, P17)

194-Q. (German.) **Deformation and Recrystallization Texture of Titanium and Titanium Alloys.** Konrad Sagel and Ulrich Zwicker. *Zeitschrift für Metallkunde*, v. 46, no. 12, Dec. 1955, p. 835-842.

Pressing and rolling textures. Anisotropy of mechanical and physical properties. General consideration of deformation mechanisms of hexagonal crystals. Diagrams, graphs, tables. 9 ref. (Q24, N5, Ti)

195-Q. (German.) **Change of Certain Properties of Metals and Alloys Through Cold Working. I. Hardness and Strength Change Through Cold Working.** Erich Dönnges. *Zeitschrift für Metallkunde*, v. 46, no. 12, Dec. 1955, p. 867-872.

Studies of rolling and rod drawing. Change of hardness by heat treatment after cold work. Experiments were carried out on metals and alloys with cubic crystal lattices. Graphs. 16 ref. (Q23, Q29, F23, F27, ST)

196-Q. (German.) **Nonhomogeneity of Hardness Caused by Cold Working Silver.** Albert Roll and Hasso Motz. *Zeitschrift für Metallkunde*, v. 46, no. 12, Dec. 1955, p. 872-877.

Effect of sample size and rate of application of load during hardness measurement. Effects of grain size, recrystallization texture and purity on hardness. Table, graphs. 7 ref. (Q29, N5, Ag)

197-Q. (Japanese.) **Reinforcement of Stress-Concentrated Area by Surface-Rolling Method.** Yoshio Ohashi and Shohei Murayama. *Journal of Railway Engineering Research (Japan)*, v. 12, no. 18, Sept. 25, 1955, p. 437-448.

Study of fatigue limit increase by surface rolling of circular-notched specimens. Data show that the strained area does not increase in the same proportion as hardness does during rolling. Tables, graphs, diagrams, photograph, micrographs. 3 ref. (Q7, F23, CN)

198-Q. (Japanese.) **Recent Examples of Broken Rails. I.** Shigeo Ohwaku and Rikio Kurihara. *Journal of Railway Engineering Research (Japan)*, v. 12, no. 20, Oct. 25, 1955, p. 511-522.

Quality tests on six types of failure of recently broken rails. Causes of failures were found and prevention measures proposed. Tables, diagrams, photographs, micrographs. (Q26, S21, ST)

199-Q. (Russian.) **Methods of Determining Plasticity and the Degree of Its Localization During Tensile Tests.** G. I. Pogodin-Alekseev. *Zavodskaia laboratoriia*, v. 21, no. 11, 1955, p. 1365-1370.

Distribution of residual deformation along length of specimen. Equations for deformation as a function of stress and distance from end of specimen. Effect of temperature. Graphs, table, diagram. 3 ref. (Q27, Q24, ST)

200-Q. (Russian.) **Tensile Testing of Metals for Boilers and Vessels by Means of Ring-Shaped Specimens.** T. A. Vladimirskii and N. V. Pashkov. *Zavodskaia laboratoriia*, v. 21, no. 11, 1955, p. 1371-1374.

Degree of deformation in stretching flat and ring-shaped specimens. Relation between yield strength and relative elongation. Tables, graphs, diagram. 6 ref. (Q27, Q23, CN)

201-Q. (Book.) **Symposium on Basic Effects of Environment on the Strength, Scaling, and Embrittlement of Metals at High Temperatures.** ASTM Special Technical Publication No. 171. 114 p. 1955. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa.

Six papers on oxidation and surface effects. (Q23, R2)

202-Q. (Book—German.) **Thermal Stresses, as a Result of Stationary Temperature Fields.** Ernst Melan and Heinz Parkus. 114 p. 1953. Springer-Verlag, Vienna, Austria.

Fundamentals of heat conductivity and thermal elasticity. Stress-free temperature fields. Thermal stresses in laminae and rotating bodies. Effects of inclusions. (Q25, Q21, P11)

R

Corrosion

84-R. (English.) **Low-Alloy Steels Resistant to Stress-Corrosion Cracking.** *Aciers fins & spéciaux francais*, no. 21, Nov. 1955, p. 29-32.

Applications for chromium-aluminum corrosion resistant steels. Micrographs. (R1, SS)

85-R. (French.) **Investigation of Fe_3O_4 Precipitation in Superficial Iron Oxide Films at Elevated Temperatures.** J. Paidassi. *Revue de métallurgie*, v. 52, no. 11, Nov. 1955, p. 869-886.

Relates FeO formation and Fe_3O_4 precipitation to temperature changes and heat treatments. Diagrams, micrographs, graphs. 16 ref. (R2, N7, ST)

86-R. (German.) **Corrosion and Corrosion Protection on Power-Plant Equipment. II.** B. Müller. *Energietechnik*, v. 5, no. 10, Oct. 1955, p. 444-451.

Types of corrosion phenomena on power equipment, turbines and related apparatus and use of cathodic protection. Diagrams, graphs, tables. 6 ref. (R10)

87-R. (German.) **Composition of the Scale Forming on Hot Rolled Strips and Sheets.** Walter Fackert. *Stahl und Eisen*, v. 75, no. 25, Dec. 15, 1955, p. 1705-1710.

Factors and variables involved in formation of scale on steel. Describes device for recording the dissolution lines of scale and its use in determining the scale structure of six hot rolled strip sections of different origin. Graphs, micrograph, diagram. 9 ref. (R2, F23, ST)

88-R. (German.) **Cathodic Corrosion Prevention.** F. Ritter. *Werkstoffe und Korrosion*, v. 6, no. 11, Nov. 1955, p. 523-527.

Protection of metals by using a negative potential flow in the oxidizing medium. Diagrams, photographs. 1 ref. (R10)

89-R. (Italian.) **Problem of the Protection of Methane Pipes Against Electrolytic Corrosion. III.** G. Bianchi. *Rivista dei combustibili*, v. 9, no. 10, Oct. 1955, p. 789-824.

Evaluates effective protection of an underground structure. Grounding measurements as a criterion of protection. Diagrams, graphs, table. (R10, R11)

90-R. (Russian.) **Oxidation of Bi_2Se_3 and Bi_2Te_3 Specimens During Heating in Air.** S. A. Semiletov and Z. G. Pinsker. *Zhurnal tekhnicheskoi fiziki*, v. 25, no. 13, Nov. 1955, p. 2336-2338.

Electronographic study of structure of thin layers formed by sublimation. Table. 2 ref. (R2, Bi, Te)

91-R. **How to Reduce Hydrogen Attack.** Gordon R. King. *Petroleum Refiner*, v. 35, Jan. 1956, p. 124-128.

Although hydrogen attack in the oil industry cannot as yet be eliminated, it can be reduced. Locally, concrete protective liners seem most economical. Generally, water washing and air injection methods have proved effective. Diagram, graph, photographs. 32 ref. (R9, ST)

92-R. **What Happens in H_2-H_2S Corrosion.** E. B. Backensto, Robert D. Drew and Carvel C. Stapleford. *Petroleum Refiner*, v. 35, Jan. 1956, p. 147-150; disc., p. 150-151.

Corrosion data on steel, low-chromium alloy and chromium-nickel alloy in hydrogen-hydrogen sulfide atmospheres at high temperatures. Use of chromium-nickel stainless steels, reduction of hydrogen sulfide concentration in environment, protection of metal surfaces by coating with aluminum aid in minimizing corrosion. Graphs, micrographs, tables, photograph. 3 ref. (R9, ST)

93-R. **How Can We Prevent Steam Turbine Erosion and Corrosion?** F. H. Pennell. *Power Engineering*, v. 60, Jan. 1956, p. 100-101.

Better resistance to corrosion and erosion may be effected by design improvements and by improving the surface of the blade. Diagrams, photographs. (R4)

94-R. **Resistance of Materials to Mechanical Corrosion.** Russell W. Henke. *Product Engineering*, v. 27, Jan. 1956, p. 194-197.

Causes of stress-corrosion, corrosion fatigue, impingement erosion and fretting. Guides to choice of the most resistant materials and remedies possible in design. Photographs. (R1, Cu, Al, Fe, Ni, AY)

95-R. **Structure of Oxides Formed on High-Temperature Alloys at 1500° F.** John F. Radavich. Paper from "Symposium on Basic Effects of Environment on the Strength, Scaling, and Embrittlement of Metals at High Temperatures". ASTM Special Technical Publication No. 171, p. 14-31; disc., p. 32-34.

Study of the oxide structures formed on various alloys by means of electron microscopy and electron and X-ray diffraction. Tables, micrographs. 13 ref. (R2, M21, M22, SG-h)

96-R. **Effect of Strain on the Oxidation of Nickel-Chromium Heater Alloys.** Earl A. Gulbransen and Kenneth F. Andrew. Paper from "Symposium on Basic Effects of Environment on the Strength, Scaling, and Embrittlement of Metals At High Temperatures". ASTM Special Technical Publication No. 171, p. 35-46; disc., p. 47-48.

New test method by which a metal is oxidized a given amount, strained 1 to 4% and then reoxidized. Rates of oxidation before and after strain measured. Graphs, ta-

92-R. **What Happens in H_2-H_2S Cor-**

97-R. **An Investigation of Intergranular Oxidation in Type 310 Stainless Steel.** R. E. Keith, C. A. Siebert and M. J. Sinnott. Paper from "Symposium on Basic Effects of Environment on the Strength, Scaling, and Embrittlement of Metals at High Temperatures". ASTM Special Technical Publication No. 171, p. 49-60; disc., p. 60-64.

Establishes effect of time and temperature on intergranular oxide penetration and determines whether appreciable differences in composi-

tion exist between the intergranular oxides and the external scales. Graphs, diagrams, micrographs, tables. 19 ref. (R2, SS)

98-R. The Properties of Oxidation-Resistant Scales Formed on Molybdenum-Base Alloys at Elevated Temperatures. M. Gleiser, W. L. Larsen, R. Speiser and J. W. Spretnak. Paper from "Symposium on Basic Effects of Environment on the Strength, Scaling, and Embrittlement of Metals at High Temperatures". ASTM Special Technical Publication No. 171, p. 65-86; disc., p. 87-88.

Various molybdates and molybdenum-containing oxide complexes were tested for stability at elevated temperatures to determine if they would be stable at operating temperatures and possibly present a barrier to further oxidation. Graphs, tables. 24 ref. (R2, Mo)

99-R. Oxidation at Elevated Temperatures. John F. Radavich. Paper from "Symposium on Basic Effects of Environment on the Strength, Scaling, and Embrittlement of Metals at High Temperatures". ASTM Special Technical Publication No. 171, p. 89-113; disc., p. 113-114.

Various techniques used and results of oxidation of seven high-temperature alloys. Micrographs, tables, graphs. 10 ref. (R2, SS, SG-h)

100-R. Mechanism of Corrosion of Iron by Sulfur. P. V. Gel'd and O. A. Esin. *Henry Brutcher Translation No.* 3186, 10 p. (From *Zhurnal prikladnoi khimii*, v. 19, no. 7, 1946, p. 677-683.) Henry Brutcher, Altadena, Calif.

Present theories reviewed; concludes that sulfide corrosion of iron is due to defects in iron-sulfur system phases. Graphs. 14 ref. (R1, Fe, S)

101-R. Method for Corrosion-Fatigue Testing. L. A. Glikman and L. A. Suprun. *Henry Brutcher Translation No.* 3608, 6 p. (From *Zavodskaya laboratoriya*, v. 21, no. 4, 1955, p. 464-466.) Henry Brutcher, Altadena, Calif.

Structural steel and gray iron tested in air, river water and 3% salt solution by a machine operating the unused specimen at 2860 r.p.m. Table, graphs, diagrams. 4 ref. (R1, R3, R4, CI, CN)

102-R. (German.) **Chemical Stability of Molybdenum Disilicide as a Construction Material.** E. Fitzer and J. Schwab. *Metall*, v. 9, nos. 23-24, Dec. 1955, p. 1062-1066.

Properties and behavior at high temperatures; attack by various molten metals. Micrographs, graphs, tables, photographs. 16 ref. (R6, Mo)

103-R. (Russian.) **Interaction of Metals With Sulfur Dioxide.** E. I. Danilova and G. S. Frents. *Izvestiia akademii nauk SSSR, otdelenie tekhnicheskikh nauk*, no. 11, Nov. 1955, p. 25-33.

Phase composition changes of the reaction products of zinc, copper, lead and cadmium in relation to temperature and pressure of sulfur dioxide. Graphs, tables. 6 ref. (R9, P12, Zn, Pb, Cu, Cd)

104-R. Compositional Factors Affecting Corrosion Resistance of Zirconium in High-Temperature Water and Steam. Walter K. Boyd, Daniel J. Maykuth, Robert S. Peoples and Robert I. Jaffee. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, BMI-1056, Nov. 1955, 90 p.

Studies to correlate the composition and structure of a number of sponge zirconium alloys with their corrosion resistance. Effects of varying amounts of carbon, gaseous impurities and alloying constituents. A new technique was utilized for melting small ingots in an attempt to obtain reliable and reproducible results. Diagram, graphs, micrographs, tables. 9 ref. (R4, Zr)

105-R. The Problem of Corrosion in Petroleum Refining. I. E. J. M. Tait. *Corrosion Prevention and Control*, v. 2, Dec. 1955, p. 25-30, 44.

Nature of and an approach to solving the external and internal corrosion. (To be continued.) (R7)

106-R. Further Studies on the Anodic Corrosion of Lead in H_2SO_4 Solutions. J. J. Lander. *Electrochemical Society, Journal*, v. 103, Jan. 1956, p. 1-8.

Interprets the thermodynamics and kinetics of the corrosion process in order to indicate means of preventing or slowing down corrosion, thus allowing longer positive grid life. Tables, graphs, diagram. 12 ref. (R5, Pb)

107-R. Mathematical Studies on Galvanic Corrosion. IV. Influence of Electrolyte Thickness on the Potential and Current Distributions Over Coplanar Electrodes Using Polarization Parameters. James T. Waber and Bertha Fagan. *Electrochemical Society, Journal*, v. 103, Jan. 1956, p. 64-72.

Evaluation of Fourier series to show influences of liquid depth and polarization parameter. Diagram, graphs. 14 ref. (R1)

108-R. Electrochemical Corrosion in Nearly Neutral Liquids. U. R. Evans. *Electrochemical Society, Journal*, v. 103, Jan. 1956, p. 73-85.

Report on years of study of corrosion mechanism. Considers general corrosion, pitting and immunity. Diagrams, graphs, table. 71 ref. (R1)

109-R. High Pressure Loop Design for Studies of Reactions Between Heated Metals and High Temperature Water. D. C. Kaulitz and J. E. Minor. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission)*, HW-38876, Sept. 1955, p. 3-21.

Equipment which permits heated metals to be contacted by a rapid flow of high-temperature water. Water temperatures and pressures up to 300° C. and 2000 psi. and specimen temperatures up to 800° C. are utilized. Diagrams, photographs, graphs. (R11, R4)

110-R. Corrosion of Iron in High-Temperature Water. I. Corrosion Rates by Hydrogen Evolution at 240 to 36° C. II. Kirkendall Experiments. D. L. Douglas and F. C. Zyzes. *Knolls Atomic Power Laboratory (U. S. Atomic Energy Commission)*, KAPL-1376, Nov. 1955, 93 p.

Effects of surface finish, temperature and heat treatment; measurements were made in saturated vapor, superheated vapor and certain dilute aqueous solutions. The ion species diffusing through a magnetite film formed on corrosion of iron in high-temperature water were identified by Kirkendall-type experiments. Diagrams, graphs, micrographs, photographs, tables. 45 ref. (R4, Fe)

111-R. Characteristics and Prevention of Fretting Corrosion. R. B. Waterhouse. *Machine Design*, v. 28, Jan. 26, 1956, p. 104, 106, 108.

General considerations of the damaging results and preventive measures. (R1)

112-R. Effect of Temperature and Pressure on Steam Testing of Zirconium Alloys. D. S. Kneppel. *Nuclear Metals, Incorporated (U. S. Atomic Energy Commission)*, NMI-1119, Oct. 1954, 45 p.

A study was carried out on a group of ten experimental alloys. Data obtained were plotted on log-log paper. Unalloyed sponge, crystal bar zirconium and Zircaloy-2 were also tested. Graphs, tables. (R4, Zr)

113-R. Oxidation Rates of Molten Metals as Determined by a Recording Thermobalance. I. Tin. J. H. Bibrey, Jr., D. A. Wilson and M. J. Spendlove. *U. S. Bureau of Mines, Report of Investigations* 5181, Dec. 1955, 24 p.

Rates of oxidation of molten tin over temperature range 550 to 900° C., as determined by recording thermobalance, were found to vary widely for a given temperature. X-ray diffraction data indicated that probable cause of variations was the development of preferred orientations in crystals forming the oxide film. Photographs, diagrams, graphs, tables. 32 ref. (R2, Sn)

114-R. (German.) **A Contribution Relating to the Execution of Corrosion Tests.** Luigi Riccoboni, Paolo Papoff and Ida Maria Vezzosi. *Werkstoffe und Korrosion*, v. 6, no. 12, Dec. 1955, p. 569-571.

Description of test apparatus for determining corrosion-time relationships of a specimen in a constant amount of electrolyte and in absence of a gas phase. A polarographic control is used. Diagram. 16 ref. (R11)

115-R. (Japanese.) **A Study on Cathodic Protection of Mild Steel in Acid Solutions.** Hayata Shigeno and Toyoji Kobayashi. *Government Chemical Industrial Research Institute, Tokyo, Reports*, v. 50, no. 11, Nov. 1955, p. 361-366.

Results of experiments regarding the influence of applied cathodic current on the electrochemical behavior of mild steel and its protecting effect in sulfuric acid solutions, mine water and sulfuric acid solutions containing copper ions. Graphs, diagram, table. 5 ref. (R10, ST)

116-R. (Russian.) **Prevention of Steam Corrosion of Boiler Pipes.** D. L. Drakhman. *Energetik*, v. 3, no. 12, Dec. 1955, p. 11.

Measures include installation of special inner core-pipes within the boiler pipes. Diagram. 1 ref. (R4)

117-R. (Russian.) **Methods of Testing Stainless Steels for Their Tendency to Intercrystalline Corrosion.** *Zavodskaia laboratoriia*, v. 21, no. 11, 1955, p. 1314-1345.

Zonal peculiarities resulting from welding, corrosion media, basic reasons for tendency to corrosion, microstructural peculiarities, distribution of ferrite and austenite grains. Graphs, micrographs, diagrams, tables. 68 ref. (R2, R11, M27, SS)

118-R. (Russian.) **Methods of Studying the Corrosion of Metals at Contact Interfaces.** I. L. Rozenfel'd and I. K. Marshakov. *Zavodskaia laboratoriia*, v. 21, no. 11, 1955, p. 1346-1353.

Peculiarities of corrosion along contacts of varying tightness between metal and porcelain, glass, bakelite or other metals. Relation of total corrosion losses, intensity of corrosion and area affected to the size of the interspace in acid electrolytes of varying strength. Graphs, diagrams. 9 ref. (R11, SS, CN, Al)

119-R. (Russian.) **Installation for Studying the Anticorrosion Potential of Metal in Soil.** N. D. Tomashov and Iu. N. Mikhailovskii. *Zavodskaia laboratoriia*, v. 21, no. 11, 1955, p. 1380-1382.

Circuit of installation for stabilization of electrode potential in soil during cathodic polarization. Change in cathodic current density with time during polarization of cast iron electrode in soil. Effect of moisture of soil on corrosion rate. Circuit diagram, graph, table. (R8, R10, CI)

120-R. (Book.) **Corrosion and Protection Against Corrosion.** *Korrosion und Korrosionsschutz.* Fritz Tödt. 1102 p. 1955. Walter de Gruyter & Co., Berlin, Germany. DM. 168.

General, intercrystalline and stress corrosion; corrosion of different metals; industrial problems; testing methods. (R general)

S

Inspection and Control

71-S. Gauging Thin Films. *Automobile Engineer,* v. 45, Dec. 1955, p. 573-575.

Instruments to measure, unilaterally, the metallic or nonmetallic coatings on metal bases. Photographs. (S14)

72-S. Selective Standardization and Status of Specifications for Titanium Mill Products. *Battelle Memorial Institute, Titanium Metallurgical Laboratory Report No.* 22, Nov. 1955, 16 p.

Survey of status of wrought metal specifications to cover high-strengh sheet for fabrication by aircraft and guided-missile manufacturers. Recommendations for selective standardization of titanium sheet stock. (S22, Ti)

73-S. The 1955 Specification Revisions. E. Elliott. *Light Metals,* v. 18, Dec. 1955, p. 409-412.

Composition and mechanical properties of aluminum alloys and a guide to the selection of casting alloys. Tables. (S22, Al)

74-S. Examining Irradiated Fuels Under Water. Henry J. Bellarts, John L. Spencer and Roy S. Peterson. *Nucleonics,* v. 14, Jan. 1956, p. 30-33.

Primary inspection station, slug cleaner, dejacketer of underwater inspection station. Photograph, diagrams. (S13, U)

75-S. Detecting Flaws in Traction Gears. *Railway Locomotives and Cars,* v. 129, Dec. 1955, p. 66-69.

Explains how many gear failures can be avoided without scrapping. Photographs. (S13)

76-S. Methods for Analyzing Titanium Sponge and Intermediate Products. P. R. Perry, R. W. Lewis and T. A. Sullivan. *U. S. Bureau of Mines, Report of Investigations* 5168, Oct. 1955, 45 p.

Concise compilation of tested chemical and spectro-chemical procedures. Tables, graphs, diagrams, photograph. 16 ref. (S11, Ti)

77-S. Electronic Measurement of Hot Rolled Wire Rod. Charles D. Gibbs. *Wire and Wire Products,* v. 31, Jan. 1956, p. 72-74, 77.

Discusses a lens-rotating prism, slit-aperature photocell system, used for rod mill control, and its place in automation. Photograph, diagram. (S18, F28)

78-S. (Czech.) **Temperature Measurement of Molten Steel by the Immersion Pyrometer at the VZKG.** J. Micek and R. Chalupa. *Hutnik,* v. 5, no. 10, Oct. 1955, p. 311-313.

Instrument gives data on temperature of bath, slag and ladle after tapping. Tables, diagrams, graphs, photograph. (S16, ST)

79-S. (French.) **Study on the Empirical Formula for the Tolerance Unit.** E. Lechner. *Acta Technica Academiae Scientiarum Hungaricae,* v. 13, nos. 1-2, 1955, p. 243-253.

Amount of tolerance obtained by consideration of the dispersion of fabrication dimensions. Graph, table. (S12)

80-S. (French.) **Grade Data for Unalloyed Steels as Manufactured in Italy According to the Iron and Coal European Community Production Program.** G. Zanini Zazinovich. *Revue de métallurgie,* v. 52, no. 11, Nov. 1955, p. 895-908.

Properties of unalloyed Italian structural steels presented according to C.E.C.A. agreement. Tables. (S22, Q general, CN)

81-S. (German.) **Determination of the Carbon Content in Steel by Spectrum Analysis.** T. Török and G. Szikora. *Acta Technica Academiae Scientiarum Hungaricae,* v. 13, nos. 1-2, 1955, p. 165-184.

Equipment and methods for using hydrogen gas as a protective atmosphere. Diagrams, graphs. 30 ref. (S11, ST)

82-S. (German.) **New Method of Determination of the Molar Proportion of Cryolite Melts.** P. Nagy. *Acta Technica Academiae Scientiarum Hungaricae,* v. 13, nos. 1-2, 1955, p. 187-198.

Chemical analysis procedures to determine sodium and total fluorine contents of the wells. Graphs, tables, diagrams. 14 ref. (S11, C23, Al)

83-S. (German.) **New Data on Nondestructive Testing by Ultrasonics.** R. Pohlman. *Metalen,* v. 10, no. 22, Nov. 30, 1955, p. 471-473.

Details of continuous and of impulse-echo processes. Photographs, table. (S13)

84-S. (German.) **Use of Organic Reagents in Inorganic Analysis. I. Palladium Complexes of Some Anilic Acids. II. Determination of Thorium With Some Anilic Acids.** Sachindra Kumar Datta. *Zeitschrift für analytische Chemie,* v. 148, no. 4, 1955, p. 259-273.

Analytical behavior of seven anilic acids towards various metallic ions. Phthalanilic, p-tolylphthalanilic, and alpha - naphthylphthalanilic acids used successfully in quantitative determination of palladium by direct weighing method. Only the o and p-nitr-anilic acids and those from o-anisidine and alpha-naphthylamine were found suitable as analytical reagent for thorium. Tables, graph. 11 ref. (S11, Pd, Th)

85-S. (German.) **Carbon in Nonferrous Metals. I. Determination.** Joseph Fischer and Walter Schmidt. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 8, no. 11, Nov. 1955, p. 529-532.

Analysis of carbon in steels adapted to nonferrous metals with respect to pH-measurement. Graph, diagram. 2 ref. (S11, C)

86-S. (German.) **Scintillation Counting of (*n*, Alpha) and (*n*, *f*) Reaction for Isotopic Analysis of Lithium, Boron, and Uranium.** H. Wänke and E. U. Monse. *Zeitschrift für Naturforschung,* v. 10a, nos. 9-10, Sept.-Oct. 1955, p. 667-669.

Method for relative determination of accumulations of isotopes with application to scintillation counters and radium-beryllium preparation. Diagram, tables. 1 ref. (S11, Li, B, U)

87-S. (Polish.) **List of Metallurgical Standards (PN, PKN, RN, WT, and Zn, in Part).** *Wiadomosci hutnicze,* v. 11, no. 11, Nov. 1955, p. 355-358.

Standard designations of steels for forgings and various rolled shapes. Tables. (To be continued.) (S22, CN, AY)

88-S. Determination of Hydrogen in Titanium and Titanium Alloys. Maurice Codell and George Norwitz. *Analytical Chemistry,* v. 28, Jan. 1956, p. 106-110.

Sample is ignited in oxygen in presence of lead as a flux. Gases are passed through hot copper oxide to insure complete oxidation of the hydrogen to water and the water is collected in an Anhydrone collection tube. Diagram, tables. 68 ref. (S11, Ti)

89-S. Automatic Gage Control Applied to Cold Reduction Mill. W. E. Miller. *Blast Furnace and Steel Plant,* v. 44, Jan. 1956, p. 61-63.

Actual thickness measured by X-ray gage. Any difference between actual thickness and desired thickness is signaled and automatically compensated. Photographs, diagram. (S14, F23, ST)

90-S. Proposed Tentative Standard Chemical Methods of Analysis for the Determination of Impurities in Zirconium. E. B. Read, Helen M. Lawler and W. A. Davis. *Massachusetts Institute of Technology (U. S. Atomic Energy Commission),* MIT-1110, Mar. 1953, 77 p.

Satisfactory results have been obtained by all methods applied to the analysis of standard zirconium samples MIT-1S and MIT-CB1. Diagrams. 6 ref. (S11, Zr)

91-S. Common Sense in Quality Control. Harry C. Ahl. *Modern Castings,* v. 29, Jan. 1956, p. 57-61.

Programs keyed to needs and budgets of small bronze foundries with suggestions and examples of methods of controlling quality of castings without large expenditures. Shows how a simple, well-run program can be a good investment. Photographs. (S12, E general, Cu)

92-S. Ultrasonic Testing Prevents Press Crankshaft Failures. Leon Boyko. *Tool Engineer,* v. 36, Jan. 1956, p. 81-84.

By introducing sound waves at one end of a metal part and projecting the picked-up echoes on a cathode ray tube, internal flaws can be determined. Technique can be used to check tools for safety. Diagrams, table, photographs. (S13)

93-S. Developments in Automatic Quality Control. George H. Amber and Paul S. Amber. *Tool Engineer,* v. 36, Jan. 1956, p. 107-112.

Feasible installation of an automatic quality-control unit using presently available equipment. Photographs, diagram. 3 ref. (S12)

94-S. Identification of Mixed Stainless Steels. *Tool Engineer,* v. 36, Jan. 1956, p. 123-124.

Tests solution formulas. Flow diagram. (S10, SS)

95-S. Measuring to Millionths With Chrome Carbide. *Tooling and Production,* v. 21, Jan. 1956, p. 67-68, 116.

Discussion of accuracy and interchangeability of chromium carbide gage blocks. Calibrated to ±0.0000002. Micrographs. (S14, Cr)

96-S. Method and Apparatus for Measuring the Thickness of Steel Being Rolled, With the Aid of Radioactive Rays. A. M. Bogachev, B. I. Verkhovskii and A. N. Makarov. *Henry Brutcher Translation No.* 3568, 15 p. (From *Zavodskaya laboratoriya,* v. 21, no. 7, 1955, p. 813-820.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 274-S, 1955. (S14, ST)

97-S. Spectrographic Analysis of Carbon and Low-Alloy Steels, Also Steelmaking Pig Irons. N. V. Buyanov. *Henry Brutcher Translation No.* 3624, 7 p. (From *Izvestiya akademii nauk SSSR, Ser. Fiz,* v. 19, no. 2, p. 174-178.) Henry Brutcher, Altadena, Calif.

Results from analysis of steel containing manganese, silicon, chrominum, nickel, aluminum, molybdenum and titanium, and of pig irons with 0.8 to 4.4% manganese, and 0.2 to 1.50% silicon. Table. (S11, CN, CI)

98-S. (Dutch.) **Determination of Oxygen, Hydrogen and Nitrogen in Steel by the Vacuum Fusion Method.** Elly Hoekstra. *Smit mededelingen*, v. 10, no. 4, Oct.-Dec., 1955, p. 158-163.

Includes photographs, diagram, table. 5 ref. (S11, ST)

99-S. (French.) **Determination of Tin in Steelmaking Products.** J. Migeon. *Chimie analytique*, v. 37, no. 12, Dec. 1955, p. 416-421.

Conditions of polarographic determination of tin, an impurity of steelmaking products, in a perchloric acid-sodium chloride mixture after separation of the tin by distillation. Tables, graphs, diagram. 27 ref. (S11, Sn)

100-S. (French.) **Ultrasonic Detection of Penetration in Autogenous T-Welds.** Georges A. Homes. *Revue de la soudure (Brussels)*, v. 11, no. 4, 1955, p. 204-213.

Studies of the penetration of ultrasonic waves at oblique and perpendicular incidences to metal surfaces. Photographs, diagrams, oscillograms, tables. (S13, K19)

101-S. (German.) **X-Ray Fluorescence Spectroscopic Analysis and Its Importance in Metallography.** Otto Werner. *Archiv für das Eisenhüttenwesen*, v. 26, no. 12, Dec. 1955, p. 721-737.

Device for producing and measuring X-ray fluorescence radiation, its application in quantitative and qualitative analysis in addition to the measurement of the layer thickness. Graphs, tables, diagrams, photographs. 43 ref. (S11, M23)

102-S. (Russian.) **Fast-Acting Sensitive Pyrometer.** M. G. Kogan. *Vestnik mashinostroeniia*, v. 35, no. 12, Dec. 1955, p. 58-59.

Circuit and operation of a new instrument for more effective measurement of temperatures during induction heating. Photograph, circuit diagram. 9 ref. (S16)

103-S. Improving Casting Quality Through Non-Destructive Testing. Francis H. Hohn. *American Foundrymen's Society, Transactions*, v. 63, 1955, p. 446-450.

Equipment and procedures used to obtain information about defects (porosity, shrinkage, cracks, etc.) in steel castings. Diagrams, photographs, radiographs, graphs. (S13, CI)

104-S. Practical Methods for Attaining Constant Sensitivity and Density in Industrial Radiography K. G. Roberts. *American Foundrymen's Society, Transactions*, v. 63, 1955, p. 669-674.

A uniform film density, having optimum radiographic sensitivity, may be obtained by varying the kilovoltage with specimen thickness and material density. Exposure time is then only related to source-to-film distance. Tables, graphs. 9 ref. (S13)

105-S. Non-Destructive Testing—A Valuable Tool for the Foundryman. Hans J. Heine. *American Foundrymen's Society, Transactions*, v. 63, 1955, p. 726-727.

Nondestructive inspection of castings and flaws most frequently recognized. Tables. 4 ref. (S13)

106-S. Use of Cobalt 60 for Castings. Jewelle N. Ketchbaw. *American Foundrymen's Society, Transactions*, v. 63, 1955, p. 728-729.

Use of cobalt-60 to find information about the internal conditions of a casting. Radiograph, photographs. (S13)

107-S. Increased Foundry Profits Through Non-Destructive Testing. Kermit Skeie. *American Foundrymen's Society, Transactions*, v. 63, 1955, p. 730-731.

Includes table, photographs. (S13, E general)

108-S. Radiography—A Nondestructive Test for the Foundry. William D. Kiehle. *American Foundrymen's Society, Transactions*, v. 63, 1955, p. 736-740.

Basic radiographical methods for testing castings and benefits realized by the foundryman. Radiographs, diagrams, photographs. (S13, E general)

109-S. The Analysis of Phosphating Preparations Used for the Protection of Steel Surfaces. G. H. Bush, D. G. Higgs and F. W. Box. *Analyst*, v. 80, Dec. 1955, p. 885-896.

Analytical methods for determination of major and minor constituents in solid and liquid manganese and zinc phosphating preparations used for the protection of steel surfaces. Tables. 6 ref. (S11, L14, ST)

110-S. The Significance of *mu* in the Specification of Surface Finish. *Mechanical World and Engineering Record*, v. 136, Jan. 1956, p. 14-16.

Explanation of basic surface finish techniques and differences between European, British and American methods of measurement. Significance of standard symbols designating roughness, waviness and lay. Graphs, diagram. (S15)

111-S. Investigation on the Ultrasonic Testing of Glued Metal Joints. J. Schijve. *Netherlands National Luchtvaart-laboratorium Report*, M. 1995, 1955, 25 p.

Theoretical analysis for ultrasonic and resonance tests performed on glued metal joints, manufactured in such a way that the quality of the bonding was unfavorably influenced by different causes. Diagrams, graphs, photographs, tables. 9 ref. (S13, K12)

112-S. Where Should You Draw the Line? J. B. Caine. *Steel*, v. 138, Jan. 23, 1956, p. 74-76.

Standards for magnetic particle inspection of ferrous metals. Diagrams. (S13, Fe)

113-S. Tracer Fixtures Expand Use of Optical Gaging. *Western Machinery and Steel World*, v. 47, Jan. 1956, p. 95.

Reticule tracing equipment and procedures for accurately gaging parts previously considered too difficult for inspection on contour projectors. Diagrams, photograph. (S14)

114-S. A Design for Non-Sticking Plug and Ring Gages and Locators. Lawrence E. Doyle, Bernard R. Better and Bei Tse Chao. *University of Illinois Bulletin (Engineering Experiment Station Bulletin No. 433)*, v. 53, no. 38, Jan. 1956, 28 p.

Formulas have been derived and presented for the proper design of common types of plugs and rings used for gages, fixtures, jigs and other tools. Diagrams, graphs, photographs, table. 4 ref. (S14)

115-S. (Russian.) **A Problem of the Theory of Statistical Methods of Inspection and Control.** N. A. Borodachev. *Leningradskogo, universiteta, vestnik, seriia matematiki, fiziki i khimii*, v. 10, no. 11, Nov. 1955, p. 79-97.

Equations, testing reliability of variants of continuous checking during the manufacturing process, show that the percentage of rejects of defective parts would be decreased. Diagrams, graphs. 4 ref. (S12)

116-S. (Russian.) **Determination of Free and Carbide Carbon in Austenitic Chromium-Nickel Steel.** N. M. Popova and L. V. Zaslavskaia. *Zavodskaia laboratoriia*, v. 21, no. 11, 1955, p. 1285-1288.

Relation between content of free carbon and tempering and quenching temperatures. Use of bromothymol blue as specific reagent to determine concentration of carbon in solid solution. Graphs, table. 3 ref. (S11, SS)

117-S. (Russian.) **Ion-Exchange Methods in Determination of Thallium and Indium in Products From Processing of Nonferrous Metal Ores.** L. B. Ginzburg and E. P. Shkrobot. *Zavodskaia laboratoriia*, v. 21, no. 11, 1955, p. 1289-1294.

Separation of antimony and thallium by absorption from solutions of varying acidity or alkalinity. Determination of thallium in zinc and lead powders, zinc electrolytes, and metallic cadmium. Determination by fluorescent method. Tables, graphs. (S11, Ti, In)

118-S. (Book.) **Chemical Engineering Instruments and Control Methods.** E. Molloy and E. Carr, Ed. Chemical and Chemical Engineering Series. 182 p. 1954. George Newnes Limited, Tower House, Southampton Street, Strand, W.C.2, London, England.

Types of meters, controllers, and recording instruments which control quantity of a material as well as quality. (S19)

119-S. (Book.) **Standards for a Strong America. Fifth National Conference on Standards and the Thirty-Sixth Annual Meeting of the American Standards Association Proceedings (Annual Volume)**, v. 36, 1954, 97 p. American Standards Association, 70 East Forty-fifth St., New York 17, N. Y. $3.00.

Papers on standards for architecture, safety, electricity, surface finishes, agriculture, color television and industry. (S22)

120-S. (Book.) **Temperature. Its Measurement and Control in Science and Industry.** Hugh C. Wolfe, Ed., v. II. 467 p. 1955. Reinhold Publishing Corp., 430 Park Ave., New York, N. Y.

The Third Symposium on Temperature reviews developments in concepts, measurement, and standards of temperature since 1939. (S16)

121-S. (Book—German.) **Handbook for the Metallurgical Laboratory.** v. IV. Selected Methods for Arbitration Analyses and Contradicting Determinations. 168 p. 1955. Verlag Stahleisen M.B.H., Düsseldorf, Germany.

Analytical methods for settling disputes and reconciling different results on samples of the same material. Includes reagents, solvents, titration standards, etc. (S11)

T
Applications of Metals in Equipment

43-T. Calibrated Tension-Bolt. *Aircraft Production*, v. 17, Dec. 1955, p. 492-493.

Techniques of assessing load in bolts. Specially designed bolt that can be pretensioned to a specified load overcomes some of the limitations of these systems. Graphs, diagrams. (T7, Q27)

44-T. Bolting Materials for High-Temperature Steam-Plant Service. M. G. Gemmill and J. D. Murray. *Engineering*, v. 180, Dec. 16, 1955, p. 824-827.

Outline of developments in meeting increasingly severe requirements for ferritic bolt steels. Graphs, tables. 3 ref. (T7, SS)

45-T. Millions of Balls—Millionth Tolerances. Edwin H. Goodridge, Jr. *Machinery*, v. 62, Dec. 1955, p. 143-151.

Manufacturing process for balls for use in bearings and various

other applications. Diagrams, photographs. (T7, G general, ST)

46-T. Selection, Care, and Installation of Anti-Friction Bearings. E. P. Stahl. *Machinery,* v. 62, Dec. 1955, p. 174-182.

Sealing, care and installation of ball and rolling bearings. Diagrams, table. (T7, SG-c)

47-T. Carbon Steel Promises Cheaper Reactor Systems. R. U. Blaser and J. J. Owens. *Nucleonics,* v. 14, Jan. 1956, p. 68-71.

Use of carbon steel in reactor systems; effect of temperatures and velocity on rate of corrosion. (T25, R4, ST)

48-T. Aluminum in Heavy Current Conductors. William Deans. *Power Apparatus and Systems,* no. 21, Dec. 1955, p. 1192-1198; disc., p. 1198-1200.

Properties of both copper and aluminum bus conductors, design requirements for conductors and joints to obtain satisfactory performance. Tables. (T1, Cu, Al)

49-T. Experiences With the Use of Aluminum in Windings for Dry-Type Power Transformers. E. W. Tipton. *Power Apparatus and Systems,* no. 21, Dec. 1955, p. 1201-1204.

Reasons for application of aluminum to this type of transformer; basis of design; electrical, mechanical, and thermal properties and their effect on design; comparison of aluminum and copper-wound transformers; various types of joints; cost data. Photograph, tables, graphs, diagrams. (T1, Al)

50-T. Rings Truer With Quench Press. Arthur G. Portz. *Steel,* v. 137, Dec. 26, 1955, p. 66-67.

Materials used, heat treatment and rigid specifications involved in production of compressor blade retainer rings for jet engines. Diagram, micrographs, photographs. (T7, AY)

51-T. Autos Go Heavy on Light Metals. M. F. Garwood and F. H. Mason. *Steel,* v. 138, Jan. 16, 1956, p. 82-83, 85.

Importance of light metals in the automobile industry today, especially aluminum and magnesium. Subjects emphasized include economy, methods, designing, materials, wear, corrosion. Graph, photographs, table. (T21, Al, Mg)

52-T. Engineering Aspects of Liquid Metals for Heat Transfer. Thomas Trocki. Paper from "Handbook of New Nuclear Techniques". Nucleonics, p. 5-9.

Promise as reactor coolants and heat-transfer fluids for systems operating above 600° F. Tables. 2 ref. (T25, K, Na, Pb, Bi, Hg, Li)

53-T. (English.) Banding Hollow Bodies in High-Tensile Steel Wire. *Aciers fins & spéciaux francais,* no. 21, Nov. 1955, p. 51-54.

Steel wire banding and coiling lessens weight of pressure vessels giving a product with greater safety. Photographs. (T29, ST)

54-T. (English.) Utilization of Steel in the Construction of Multi-Level Car Parks. J. J. Thiry. *Acier, Stahl, Steel,* v. 20, no. 11, Nov. 1955, p. 435-440.

Design of some German and American car parks and advantages of steel in their construction. Photographs, diagrams. (T26, ST)

55-T. (Czech.) Manufacture of Locomotive Boilers. M. Jaros. *Strojirenska vyroba,* v. 3, no. 10, Oct. 1955, p. 421-430.

Sequence of technological processes includes patterns for stamping forms, drilling of holes, welding, other operations. Tables, diagrams, photographs. 4 ref. (T23, G3, G17, K general)

56-T. (Czech.) Liquid Metals—Heat-Exchange Media. V. Krizek. *Strojirenstvi,* v. 5, no. 9, Sept. 1955, p. 664-670.

Media with high coefficients of heat transfer. Possibilities of using these metals in making heat exchangers and steam generators, applications in atomic electric-power stations. Graphs, tables, photographs, diagrams. 15 ref. (T25)

57-T. (Czech.) Use of Sodium in Heat-Exchangers. F. Dubsek. *Strojirenstvi,* v. 5, no. 11, Nov. 1955, p. 819-824.

Basic physical properties of sodium as a heat-exchange medium. Use of sodium in nuclear reactors and its advantages over other coolants. Design of sodium heat-exchangers. Graph, tables, diagrams, photographs. 10 ref. (T25, Na)

58-T. Still More Aluminum Used in Cars for 1956. R. E. Conlee. *Automotive Industries,* v. 114, Jan. 15, 1956, p. 48 + 4 pages.

Automotive industry is finding many uses for aluminum, owing to its corrosion resistance and reasonable cost. Tables, diagram. (T21, Al)

59-T. Aluminum Pipe Coupler for Line Pipe Forms Joint Easily. J. E. Zachary. *Drilling,* v. 17, Jan. 1956, p. 118.

One-piece slip-lock coupler for use in petroleum industry. To form a union, it is necessary only to insert plain end of pipe into couple and release spring lock tilting ring. Diagrams. (T28, Al)

60-T. Fabricating Copper-Lined Water Heater Tanks. *Finish,* v. 13, Jan. 1956, p. 23R-25R.

Fabrication problems for an airtight and leak-proof "tank within a tank" assembly. Photographs. (T26, F general, G general, Cu, ST)

61-T. The Automotive Gas Turbine—A Challenge to Foundries. Robert H. Herrmann. *Foundry,* v. 84, Jan. 1956, p. 76-83.

Principles and operation of gas turbine engines, problems of foundries to supply quality castings needed for engine requirements. Diagram, photographs. (T21, E general)

62-T. An Aluminium River Tanker Design. E. C. B. Corlett and K. J. Fryer. *Institution of Engineers & Shipbuilders in Scotland, Transactions,* v. 99, pt. 2, 1955-1956, p. 71-94; disc., p. 94-104.

Design study of a small tanker designed to accommodate a greater dead weight on limiting dimensions sometimes met within this class of vessel. Final result in aluminum permits a useful increase in deadweight carrying capacity. Diagrams, tables. (T22, Al)

63-T. Atoms for Peace. Metallurgical Topics Discussed at Geneva. John P. Howe. *Metal Progress,* v. 69, Jan. 1956, p. 79 + 10 pages.

Major problems relating to metallic materials of construction for various power reactors now under construction or design. Photographs. (T25)

64-T. Prehardened Mold Steels for the Plastics Industry. Birger L. Johnson. *SPE Journal,* v. 12, Jan. 1956, p. 37 + 4 pages.

Properties of Cascade steel, a precipitation hardening steel containing 4% nickel, 1% aluminum, and 0.2% carbon. Graphs. (T29, ST)

65-T. Detroit Edison Survey. John O. Blair. Paper from "Metal Curtain Walls". Building Research Institute, Division of Engineering and Industrial Research, National Academy of Sciences—National Research Council, p. 39-42.

Use of 3S Alclad metal curtain walls in the River Rouge power plant project. Photograph. (T26, Al)

66-T. The Design of Metal Curtain Walls. John Hancock. Paper from "Metal Curtain Walls". Building Research Institute, Division of Engineering and Industrial Research, National Academy of Sciences—National Research Council, p. 79-98; disc., p. 117-120.

Properties and characteristics of stainless steel, application of the properties in panel design. Graphs, diagrams, photographs. (T26, SS)

67-T. (Japanese.) Studies on the Rock Drilling Tools. The Metallurgical and Rock Drilling Test of the Krupp Widia Rock Bits. Saburo Takaoka and Shigeru Fujii. *Resources Research Institute, Report (Japan),* no. 29, Nov. 1955, 35 p.

Tungsten carbide tip of the bit has a high resistance to wear. Bits are classified according to the material of the bit body, heat treatment, and brazing method. Graphs, micrographs, tables, photographs. (T28, Q9)

68-T. Castings in Airframe Design. G. W. Papen. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 425-432; disc., p. 433.

Means for expanding use of castings in aircraft. Photographs, diagrams, tables, graph. (T24)

69-T. Use of Steel Castings by Southern Pacific. B. F. Kline. *American Foundrymen's Society, Transactions,* v. 63, 1955, p. 650-656.

General report on steel used, with comparative figures on the use of castings in freight car building and maintenance. Reference to AAR specifications for material and design of steel castings used on the railroads. Tables, diagrams, photographs. (T23, CI)

70-T. Beryllium Copper Pays Its Fare. *Steel,* v. 138, Jan. 23, 1956, p. 81-82.

Beryllium-copper castings are proved superior for use in taximeters. Photographs. (T8, Be, Cu)

71-T. Titanium Takes Away the Heat. *Steel,* v. 138, Jan. 30, 1956, p. 106.

Use of titanium in helicopter exhaust system brings up to 50% savings in weight. Photographs. (T24, Ti)

72-T. Design, Fabrication and Feasibility Studies of Four Reactor Pressure Vessels for United States Atomic Energy Commission. Paper from "Feasibility Study of Pressure Vessels for Nuclear Power Generating Reactors." AECU-3062. U. S. Atomic Energy Commission, p. 1-109.

Description of each vessel, material selection, welding techniques and heat treatment procedures, estimated cost of each unit, shipping and handling details, special problems. Diagrams, graphs. 6 ref. (T26)

73-T. Report on Feasibility Study of Pressure Vessels. Paper from "Feasibility Study of Pressure Vessels For Nuclear Power Generating Reactors". AECU-3062, U. S. Atomic Energy Commission, p. 111-120.

Design and fabrication feasibility studies of four pressurized water reactor shells. Diagrams. (T26)

74-T. Final Report on Reactor Vessel Study. L. G. Pfeiffer. Paper from "Feasibility Study of Pressure Vessels for Nuclear Power Generating Reactors". AECU-3062. U. S. Atomic Energy Commission, p. 225-354.

Study covering the mechanical design, manufacturing procedures and cost estimates, based on specified diameters, lengths and number and size of openings. Diagrams, graphs, photographs. (T26)

75-T. (German.) Material Problems in Construction of Nuclear Reactors. W. Siegfried. *Schweizer Archiv für*

angewandte Wissenschaft und Technik, v. 21, no. 12, Dec. 1955, p. 377-391.

For selection of materials for nuclear reactors, their neutron absorption and artificial radioactivities are of chief concern. Before unknown purity levels of all materials have been required. Corrosion problems. Tables, graphs, diagrams, photographs. 11 ref. (T25, R general)

76-T. (Book.) **Chemical Engineering Materials.** Frank Rumford. 382 p. 1955. Chemical Publishing Co., Inc., 212 Fifth Avenue, New York 12, N. Y.

Corrosion mechanisms; tests, properties, and applications of corrosion resisting metals and nonmetals. (T29, R general, SS, SG-g)

77-T. (Book.) **Feasibility Study of Pressure Vessels For Nuclear Power Generating Reactors.** Frank W. Davis, compiler. AECU-3062. 366 p. 1955. U. S. Atomic Energy Commission. Available from the Office of Technical Services, Department of Commerce, Washington 25, D. C. $1.75.

Compilation of four reports covering material selection; fabrication techniques, cost data, and special problems involved. Individual papers abstracted separately. (T26)

78-T. (Book.) **Knife-Edge Bearings.** P. J. Geary. B.S.I.R.A. Bibliographical Survey of Instrument Parts No. 2. 61 p. 1955. British Scientific Instrument Research Association, 'Sira', South Hill, Chislehurst, Kent, England.

Emphasizes design and properties of bearings to indicate areas where more fundamental research might be undertaken. A comprehensive bibliography covers the period from about 1900 to date. (T8)

79-T. (Book.) **Metal Curtain Walls.** Charles R. Koehler, Ed. 190 p. 1955. Building Research Institute, Division of Engineering and Industrial Research, National Academy of Sciences—National Research Council, Washington, D. C. $4.00.

Progress made and the potentials and limitations in the development of metal wall construction; architectural and structural design techniques, and performance requirements in panel design. (T26)

V

Materials

General Coverage of Specific Materials

38-V. (Czech.) **Metalworking of Corrosion and Heat Resistant Steels.** Rudolf Pospisil. *Hutnik*, v. 5, no. 10, Oct. 1955, p. 293-298.

Hot and cold working, machining, grinding and polishing, pickling, brazing and oxide cutting are determined for the various steels according to chemical compositions, mechanical properties, heat treatment. Tables. 6 ref. (F general, G general, L general, K general, SS)

39-V. Nickel in Canada—With a Survey of World Conditions. W. R. McClelland. *Canada, Department of Mines and Technical Surveys, Mines Branch Memorandum Series No.* 130, 1955, 53 p.

History of nickel development, methods employed in mining, milling and metallurgy, world production and resources, principal uses. Maps, diagrams, tables, graphs. 43 ref. (B10, Ni)

40-V. Titanium-Carbide Based Hard Metals for High-Temperature Applications. *Machinery (London)*, v. 88, Jan. 6, 1956, p. 29-34.

Four alloys in which proportion of titanium carbide ranges from 75 to 35%. Tensile strength and high-temperature properties. Graphs, photographs, tables. 16 ref. (Ti, EG-d)

41-V. High-Temperature Alloy. *Metal Industry*, v. 87, Dec. 30, 1955, p. 543-546.

Development of a new nickel-base alloy, GMR-235. Its main advantage is its sparing use of strategic materials. Diagrams, micrographs, graphs, table, photograph. (Ni)

42-V. Australian Production of Ductile Chromium. H. L. Wain. *Metal Progress*, v. 69, Jan. 1956, p. 91-96.

Outstanding contributions by Australia in the field of chromium alloy research, with emphasis on the prospects of a ductile high-temperature alloy based on chromium. Diagrams, micrograph, table. (Cr)

43-V. How to Work Titanium and Its Alloys. I. Anderson Ashburn. *Metalworking Production*, v. 100, Jan. 6, 1956, p. 9-17.

Status, properties, heat treating, machining, forming, casting, welding, cleaning and finishing. Tables, graphs. (Ti)

44-V. (Spanish.) **The Quality of Steel.** Albert Portevin. *Instituto del hierro y del acero*, v. 8, no. 39, Oct. 1955, p. 541-568.

Various aspects and criteria of quality, particularly chemical and physical purity, dendritic segregation and structure and factors necessary for obtaining quality steel. Table. 34 ref. (N12, ST)

45-V. (Pamphlet.) **The Titanium Industry.** Walter E. Duncan and Henry G. Fisk. Information Circular No. 7. 38 p. 1955. University of Wyoming, College of Engineering, Natural Resources Research Institute, Laramie.

History, properties, applications, and future demand. (Ti)

46-V. (Book.) **Steels for the User.** R. T. Rolfe. 3rd Rev. Ed. 399 p. 1956. Philosophical Library, Inc., 15 East 40th Street, New York 16, N. Y.

Properties, requirements, compositions, fabrication, testing, applications of carbon and alloy steels. (CN, AY)

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FERROUS METALLURGIST: Graduate registered engineer, married, veteran. Over ten years diversified experience in steel industry including supervisory and customer contact work. Good basic technical background coupled with practical experience in application and heat treatment of steel mill products. Prefers West Coast. Box 3-85.

METALLURGICAL ENGINEER: Twenty years diversified industrial experience in production, research and supervision in the metal processing and fabricating fields. Experience includes gear metallurgy, heat treating, forging, welding, material specifications, trouble shooting and related metallurgical problems. Four years experience in missile booster field. Capable of setting up new heat treat operation. Desires position as chief metallurgist and/or staff advisor. Box 3-90.

METALLURGICAL ENGINEER: M.S. degree, age 31, married. Five years laboratory experience in evaluation and development of materials, primarily stainless steels and heavy forgings for high-temperature service, for power generation equipment. Prefers Pennsylvania-Ohio location. Box 3-95.

WELDING and METALLURGICAL ENGINEER: Holds both degrees. Age 30, single, Canadian. Seven years general experience in research and consulting work. Familiar with all welding processes, testing equipment and methods. Sound knowledge of welding metallurgy, metallography, strength of materials, welded design, fracturing of metals, ferrous and nonferrous metals. Any offer considered. Box 3-100.

PROCESS DEVELOPMENT ENGINEER: Sc.D. degree, 25 years supervisory experience as process engineer on research, experimental, development and production problems. Specialized in fabrication methods, material testing, quality process control, heat treating, surface treating and scrapless plastic forming processes of ferrous and nonferrous metals and alloys. National reputation, experienced administrator, consultant and technical writer. Employed as research director, desires position with greater responsibility in research or manufacturing development. Box 3-105.

METALLURGIST: B.S. degree, age 26, married, veteran, graduate studies in metallurgical engineering, over two years diversified research and foundry control, experience in shell and sand molding in ductile iron, stainless steel, aluminum and other nonferrous metals. Desires position in research or production dealing with castings. Prefers New York-New Jersey area. Box 3-110.

FOUNDRY METALLURGIST: With eight years diversified experience in all phases foundry metallurgy, production, including shell processing. Young, college education, pleasing personality, ambitious, married, veteran, works well with others. Desires position of responsibility in Midwest or West. Box 3-115.

RESEARCH DIRECTOR: Metallurgical chemist. Fundamental and applied research, ferrous and nonferrous metallurgy and materials. Currently directing work on the metallurgy of hot and cold rolled steel strip, pickling, annealing, electroplating, organic finishing, cladding, supplementary finishing, hot dipping of cold rolled steel, protective oils, roll oils, corrosion resistance. Age 50. Desires equivalent position. Box 3-120.

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METALLURGICAL ENGINEER: Age 28, single, B.S. degree. Graduate courses in metallurgy, psychology, industrial relations and labor relations. Five years experience in development and technical service work in steel mill. Experience includes hot rolling, cold rolling, electrolytic tinning, continuous galvanizing. Desires position with opportunities. Locate anywhere. Minimum salary $8500. Box 3-135.

PHYSICAL METALLURGIST: Married, family, B.S., M.S., Ph.D. degrees in metallurgical engineering. Five years teaching and basic research experience in metal science. Three years in aluminum industry. Desires position in basic and development research or teaching, West Coast only. Box 3-140.

CHIEF METALLURGIST: B. Met. Eng. degree, age 38. Heavy supervisory experience. All phases ferrous field. Now employed with nationally known company. Desires challenging production position as chief metallurgist or plant manager in automotive, aircraft, antifriction bearing or farm machinery fields. Cost conscious and production minded. Salary $12,000. Box 3-145.

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METALLURGICAL ENGINEER: B.S. degree. Five years experience in process metallurgy. Duties included aluminum and titanium processing, welding engineer, vendor contact and process development. Two years supervisory experience. Desires responsible position in production or processing, preferably as chief metallurgist in small company. Box 3-165.

METALLURGICAL ENGINEER: B. of Met. E., veteran, age 29, married. Five years total experience in materials and process engineering, ferrous and nonferrous, ductile and gray iron foundry, powder metallurgy research. Desires position in basic process ferrous metallurgy or practical research. Box 3-170.

MILL REPRESENTATIVE: Desires connection as mill representative or in purchasing department of well-regarded fabricator. Age 24, single, veteran. B.S. in business administration, majoring in marketing, and education in pre-law, finance, will complete work toward metallurgy degree in March. Experience in business and finance. Will travel. Box 3-175.

METALLURGIST: Indian metallurgist desiring to continue training and studies in the United States, wishes to obtain position to pay living expenses before coming. Interested in ferrous foundry, automotive or locomotive industries. Age 30, single, B.S. degree in metallurgy. Experience in metallurgical and engineering positions in large Indian steel companies, including sheet and rolling mills, steel melting shop, electric arc furnace heat treatment and physical and chemical engineering. Has supervised foundry and engineering workshops, is presently supervisor in heavily mechanized foundry shop. Box 3-180.

STEEL MILL METALLURGIST: Turkish metallurgist wishes to locate in steel mill in the United States. Holds degree from German university and B.S. and M.S. degrees in metallurgy from University of Illinois. Eighteen years experience in Germany, Turkey and United States. Box 3-185.

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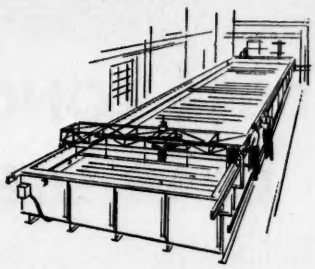

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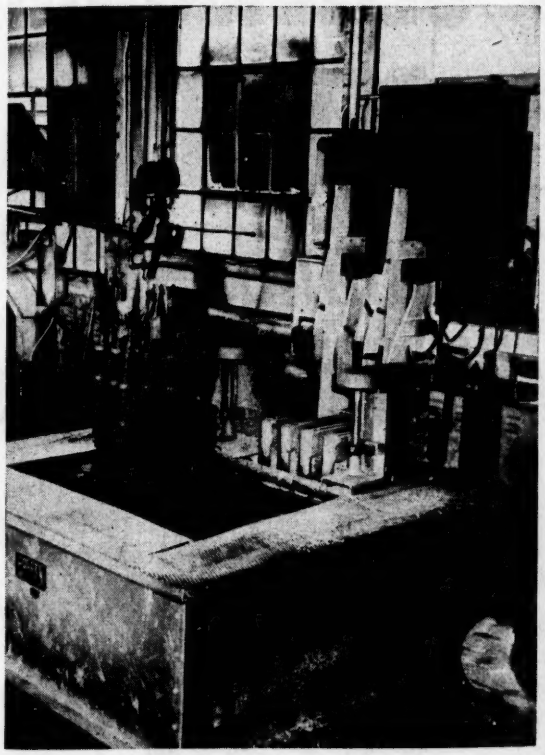

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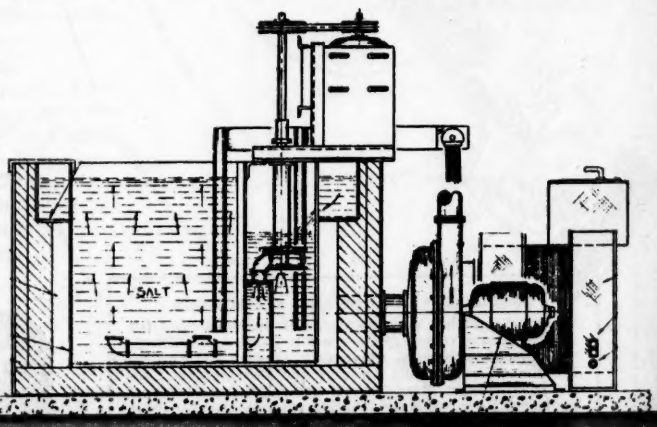

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